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Preface to Volume XXV

Humanism versus Grammar (1)

The main purpose of the American Council of Learned Societies, as I understand it, is the defense of humanism. We would probably all agree on this, though our definitions of humanism might be different. The Council should have the courage, and give itself the glory, of defining it, — not, in the usual way, in opposition to science, but, in the new way — the way of the New Humanism — in opposition to grammar.

Every subject has its grammar which is fundamental but must remain subservient to higher purposes. We are all familiar with that situation and its implications in the matter of languages. We realize that one cannot know a language well (nor the culture which it represents) if one has not mastered its grammar. That grammar by itself, however, is *not* humanism.

There is a technique, a " grammar " to every subject; there is a grammar of anatomy, a grammar of chemistry, and so on, and scientists who have remained on the technical stage cannot be humanists.

On the other hand every subject — and not only the philological ones — has its higher level, which is properly the humanistic level. We know what we mean when we speak of English humanism, or classical humanism, or Sanskrit humanism, but there is also — in the same spirit — something which might be called medical humanism, chemical humanism, and so on.

A chemical humanist (for example) is a man who knows not only chemical facts and theories (and he could not know

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(1) Remarks made at the annual dinner of the American Council of Learned Societies, Hotel Mayflower, Washington, D.C., on January 31, 1936. They are published on the basis of notes which I wrote on the *following* morning, somewhat in the manner of a reporter. However, I was a privileged reporter, for whatever I did say, I knew very well what I wanted to say.

them too well); he also knows their genesis and evolution; he is familiar with the great men of all ages and countries to whom we owe the chemical discoveries, he has read or examined the famous books and memoirs wherein those discoveries were first explained; in short he knows not only the present of chemistry but its past — all the vicissitudes, the humanities, the glories of our chemical experience. I should add that the chemical humanist does not only know our chemical past; it would be more correct to say that he is familiar with the past of mankind with special reference to chemistry. He is able to integrate chemistry with the rest of our culture; to explain chemical history in terms of human history in general, and on the other hand to enrich our culture with the incorporation into it of our chemical wisdom.

Many grammarians and philologists, many historians even, do not deserve the fair name of " humanist " because they have never been able to lift themselves above the dead level of grammar. There is in the world to-day a superfluity of scientists and learned men — some of them very distinguished — who have become virtuosi in a certain field, but are nothing more. They may make occasionally important discoveries, but they are not humanists. I often feel that the mastery of a difficult technique is but too often a cloak for intellectual mediocrity in the same sense that dogmas and rites are often convenient substitutes for religion.

On the other hand, think of such men as the chemists MARCELIN BERTHELOT and WILHELM OSTWALD, as the biologist THOMAS HENRY HUXLEY, as the mathematician HENRI POINCARÉ — were these not full-fledged humanists and did many of the other humanists ever soar as high as they did? These men were not only technicians, pioneers, discoverers, they enriched not only our knowledge, but our wisdom as well, they lifted our minds and hearts up to a higher level, they enlarged our humanity.

What does it matter after all whether the poet or the wise man found his inspiration in the eyes of a girl or in the stars of heaven, in the solution of physiological mysteries or in the transcendental subtleties of geometrical patterns and rhythms? What does it matter whether noble ideas were expressed in Greek or in French, in Arabic or in Chinese? It is the ideas that matter above everything else — immortal ideas of justice, beauty and truth, — humanism, not grammar.

All the classifications by subjects or languages may be necessary for practical purposes but from a higher point of view they are singularly irrelevant. No division is more stupid than the vertical division between science on the left and the humanities on the right; it must be replaced by the horizontal one between grammar or technique below and humanism above.

GEORGE SARTON.

The meanings of the philosophers by al-Ghazzālī

Maqāṣid al-falāsifa lil-Ghazzālī. Published in the original Arabic. Cairo, A.H. 1331-A.D. 1912, Sa'āda Press, pp. 328.

ALGAZEL's *Metaphysics.* A Mediaeval Translation. Edited by the Rev. J. T. MUCKLE, C.S.B., Professor of Mediaeval Latin and Palaeography in The Institute of Mediaeval Studies, St. Michael's College, Toronto, Canada, 1933. Pp. xx+248.

These two books are at present our entire available basis for a knowledge of one of the works most fundamentally important in the scholastic theology and philosophy of the mediaeval world, Christian and Muslim. The Arabic and Latin MSS, the Latin edition of Venice 1506, the Hebrew translation, can hardly be regarded as available. For the translations into Latin and Hebrew the simplest reference is to SARTON's *History*, vol. ii, pp. 171, 877. Chapters 1 and 2 of the *Logic* were edited and translated by G. BEER, Leiden, 1888, as a dissertation. Yet the method of the introduction of the book to Europe gave rise to one of the most unhappy misunderstandings in the history of philosophy, a misunderstanding which survives in the title of Professor MUCKLE's edition of the Latin translation. For the book most emphatically is not AL-GHAZZĀLĪ's Metaphysics but is an objective statement by him of what the Neoplatonic-Aristotelian philosophers of Islam meant in their books. The word " meanings " in its title is used much in the same way as in the title of CHARLES KINGSLEY's pamphlet, " What, then, does Dr. NEWMAN mean? " This is what the philosophers " meant ". A *maqṣad* is what is intended or meant. *Maqṣad al-kalām* is " the intended sense of the saying." The word is thus a synonym of *ma'nā* in the sense " meaning " or " idea." But the whole western world took it that here was AL-GHAZZĀLĪ speaking for himself and drew up lists of his principal errors. They were grievous errors

for that world, but they were not his. There is a full examination of this by Fr. Maurice Bouyges, S.J., in the *Mélanges de la Faculté Orientale*, Université Saint Joseph, Beyrouth, vii, pp. 398 f, 404 ff.

How did this misunderstanding arise? Simply because the Latin translator, through sheer unhappiness, omitted al-Ghazzālī's preface and colophon. It is possible, also, that he may have worked from an incomplete MS. A translation of that preface will be given here, with a description of the whole work, and will make the situation perfectly clear. The Cairo edition is not, of course, "critical"; it has no apparatus; it was made apparently from two MSS only; but it gives a sound text. It is the only edition and, according to Sarkis' *Bibliographie Arabe* (1929 but covers only up to 1919), *Fasc. viii. Col.* 1415, it has not been reprinted. The book does not seem to have been common in the East. The Sayyid Murtaḍā in his commentary on the *Iḥyā* (i, p. 42) knew it, but apparently did not possess it. Yet, according to Brockelmann i, p. 425, there is a commentary on it by Taftazānī in the Yeni Library at Istanbul.

The date of this book and of its sequel, the *Tahāfut* can be fixed quite definitely. More than thirty-five years ago I investigated the point in detail in my "Life of al-Ghazzālī" which appeared in vol. XX, pp. 71-132 of JAOS for 1899. For the *Maqāṣid* and the *Tahāfut* see there especially pp. 98 f., where the writing of them is put in the years immediately before he left Baghdad, towards the end of A.H. 488, Nov. 1095. The same is given in the Chronological Table which forms Appendix I to my translation of a Book of the *Iḥyā* in JRAS for 1901-2, 1902, pp. 14-18. Since then Fr. Bouyges in his edition of the *Tahāfut* (reviewed *Isis*, vol. X (2), pp. 497 ff., June 1928) in 1927, p. ix, gives a note which he has found in a MS of that book, the sequel to the *Maqāṣid*, that the book was finished Muharram II, A.H. 488, that is, January 22, 1095. This date Fr. Bouyges accepts as it agrees with other investigations he has made in the chronology of al-Ghazzālī's life. I agree with him in accepting this date. It fits in with the development of al-Ghazzālī's studies and thinking and with the psychological crisis of his life.

Following a regular convention in the writing of didactic treatises, al-Ghazzālī begins with an address to a supposed disciple who has asked for instruction.

"You have desired from me a doubt-removing discourse, uncovering the falling to pieces *(tahāfut)* of the philosophers and the mutual contradictions in their views and how they hide their suppressions and their deceits. But to help you thus is not at all desirable except after first teaching you their position *(madhhab)* and making you know their dogmatic structure. For it is absurd to consider the falsity of positions before understanding their sources; it is indeed shooting an arrow blindly and at a venture. So I was of opinion that I should prefix to an exposition of how they fall to pieces a concise discourse *(kalām)* containing a reproduction *(ḥikāya)* of their meanings *(maqāṣid)* as to the sciences which they cultivate, logical, physical and theological, without distinguishing between the sound and the false in them (*ḥaqq*, *bāṭil* = real, unreal). That is I intend only to make intelligible the ultimate *(ghāya)* of their doctrine without anything like expansion or addition going beyond what they mean. And I shall state it by way of accurate relation of facts and reproduction, joined with what they hold to be proofs. The object of this book is reproduction of *The Meanings of the Philosophers (Maqāṣid al-falāsifa)* and that is its title.

I teach you, then, first, that their sciences are in four parts : mathematics *(riyāḍiyāt)*, logic *(manṭiqīyāt)*, physics *(tabī'īyāt)*, theology *('ilāhīyāt)*. The mathematical sciences consider arithmetic *(ḥisāb)* and geometry *(handasa)* and there is nothing in their requirements contradictory to reason and they cannot be met with denial and contention; so there is no reason why we should trouble to state them. In theology the most of their articles of belief are opposed to that which is sound and little therein is right. In logic most is right and there is little error; it contradicts the people of sound views *(ahl al-ḥaqq)* only in technical terms and in expressions *('irādāt)*, as opposed to ideas *(ma'ānī)* and meanings *(maqāṣid)*, since its object is to correct the methods of proof and that is something in which thinkers agree. In physics the sound is mixed with the false and right is dubiously like to error; so no general judgment can be passed upon it. In the *Tahāfut* will be explained the falsity of what must be held false.

Let us, then, understand that what we are now stating is by way of reproduction *(ḥikāya)*, unconsidered, unrestricted, without investigation as to the sound and the corrupt. When we have finished with that we will begin again seriously and with purpose in a separate book which we shall call, if it be the will of Allāh, *Tahāfut al-falāsifa*, "The falling to pieces of the structure built by the philosophers." Let the beginning be understanding and stating Logic."

The reiteration here shows how deeply AL-GHAZZĀLĪ feared that his purpose would be misunderstood, or misrepresented, and that the opinions in this book would be ascribed to him personally. It must have been known that he for some considerable time—three years, he says himself—had been studying the philosophers and meditating on their results. And his fears have been largely fulfilled. As has been said above, the book was held in the West to be an expression of his own position.

The first Part, on Logic, follows on pp. 4-71; the second Part, on Theology, on pp. 74-230. This is really metaphysics and begins with a discussion of Being *(wujūd)* and the Ens *(mawjūd)*.

This leads to philosophical theology and a discussion of God as "He whose existence is necessary" *(wājib al-wujūd)*. AL-GHAZZĀLĪ explains that it was the custom of the philosophers to treat Physics before Metaphysics, but he has changed the order because of the greater importance of Metaphysics, that it is more controversial and that it is the extreme term *(ghāya)* and real meaning *(maqṣad)* of the sciences. The philosophers postponed it because of its abstruseness and because of the difficulty of approach to it before taking up Physics, but AL-GHAZZĀLĪ will give in the course of the discussion what of Physics is necessary as a basis for the understanding of the meaning. It may be guessed that this change of order reflects how he had himself approached these sciences, and made his notes on them. He would naturally look first into the theology and, then, hark back for explanations to physics. His reproduction of the meanings, or ideas, of this science will be given in two Introductions and five Discussions. The first Introduction is on the division of the sciences and that division is primarily into metaphysical theology, mathematics and physics. The second Introduction is as to the subjects of these three sciences. Then come the five Discussions of metaphysical theology: (i) Being, its laws and essential attributes. (ii) The essence of Him whose being is necessary and what inheres in Him. (iii) His qualities. (iv) His acts. (v) How the being of things proceeds from the first Beginning and of the order of secondary causes and how they mount to One who is the Causer of causes.

The third Part, the so-called Physics, follows on pp. 234-320. It is concerned with the physical world, as subject to change and motion and rest. At the beginning of this Part it is said that it consists of four Discussions, but in the text as it stands, Arabic and Latin, a fifth Discussion is added. The four are: (i) That which belongs to all bodies, form and matter and motion and place. (ii) A consideration of the doctrine of the simple body. (iii) A consideration of the compounded and mixed. (iv) A consideration of the "soul" *(nafs)*, plant, animal and human, "and with it the object *(gharaḍ)* is complete."

That seems final, but the fifth Discussion comes on pp. 301-320 and deals with the effects of the "pouring forth" *(faiḍān)* of the Active Intellect *(al-'aql al-fa"āl)* on "souls." It is thus,

in a sense, a psychology and links up with the part of the Theology (pp. 220 f.) which describes the " procession " *(ṣadr)* of the ten immaterial Intellects and the nine Spheres from the First *(al-'awwal)*. The tenth is the Active Intellect and its Sphere is that of the Moon. In FR. BOUYGES' edition of the *Tahāfut*, p. 114, there is a similar account of the origin of the Intellects and the Spheres. The tenth is the last *(al-'akhīr)*, and it is called the Active Intellect because it is immaterial and in continual action upon " souls." This working is considered under ten heads : the evidence of the soul as to the Active Intellect; how that Intellect works on the soul; happiness and misery of the soul after death according as it responds; the cause of spiritual vision true and false; the whole problem of perception of the Unseen World by the soul; the doctrine of prophets and of their evidentiary miracles and of the wonders *(karāmāt)* of the saints. This, then, is a philosophical psychology, an attempt to bring the phenomena of the intellectual and religious life, as experienced in Islam, under the Neoplatonic-Aristotelian scheme of Intellects, Souls and Spheres. In the *Tahāfut* a similar exposition on pp. 254-270, 366ff. should be compared. The Discussion is in AL-GHAZZĀLĪ's style but, from the nature of its subject, it is markedly more theological than philosophical and may quite easily have been added as an after-thought. That would mean that he had not, in the confusion of his departure from Baghdad, finally revised the book and the book may have got into circulation in an unrevised form. The MSS of the Latin translation have the same contradiction, but it has been removed in the Venice edition of 1506.

It is part, further, of the ambiguity as to the *Maqāṣid* that AL-GHAZZĀLĪ himself seldom (or never?) alludes to it by name. In the *Munqidh* (ed. Cairo, 1303) he tells of his study of the philosophers and names the *Tahāfut* twice (pp. 10, 11, 16), but he does not name the *Maqāṣid*. GOLDZIHER has pointed out in his *Streitschrift des Gazālī gegen die Bātinijja-Secte* (Leiden, 1916) that AL-GHAZZĀLĪ in this book, his *Mustaẓhiri*, alludes plainly to his refutation of the philosophers but he does not name the *Tahāfut* nor the *Maqāṣid* (pp. 28, 45 and text pp. 9 f.). This, with other considerations (GOLDZIHER, pp. 25 ff.), gives a date for the *Mustaẓhirī* after the 11th Muharram 488 (Jan. 1095) and before Dhū-l-Qa'da 488 (Nov. 1095) when he abandoned

everything and left Baghdad as a wandering Ṣūfī. In this book there is a very singular passage (text, p. 10, ll. 5 ff.) where he says that a part of the views of the philosophers on prophecy was susceptible of an interpretation which he would not reject. Similarly in his *Mi'yār'al-'ilm*, a book intended to be a standard and guide in intellectual investigations and especially as to the language and technical expressions of the philosophers, he names the *Tahāfut* but not the *Maqāsid* (p. 22 of ed. Cairo, 1329). Also in his *Miḥakk an-naẓar*, a similar but shorter book, he names the *Tahāfut* (p. 51 of ed. Cairo, Adabīya Press), but not the *Maqāṣid*. It may be, then, that the *Maqāṣid* was left by its author in an unfinished and quasi-unpublished state; it may represent lectures that never reached book form, much like some of the Aristotelian treatises. We know from a note at the end of his *Miḥakk* (p. 133) that the *Mi'yar*, when the *Miḥakk* was written, was in such an unfinished condition and not given over to formal publication. Afterwards, to judge from the edition of Cairo 1329, the *Mi'yar* was revised and completed.

The book closes (p. 320) with a reiteration that it is simply a reproduction of the logical, theological and physical sciences of the philosophers without any attempt to distinguish between what is true and what is false. That will be done in the Book of the *Tahāfut*. Like the similar preface, this reiteration does not occur in the Latin translation, and it is a permissible conjecture that the form which reached the West was still more unfinished than the printed Arabic text and had neither the preface nor the ending. Otherwise it is hard to understand how the translator into Latin should have mutilated his source and made AL-GHAZZĀLĪ responsible for those heretical opinions. The mischief thus wrought has been immense and is still abiding. We are deeply indebted to Professor MUCKLE for his most careful edition of the two Books on Metaphysics and Physics—he does not give the Logic—but there is no word of admonition in the preface that these do not give AL-GHAZZĀLĪ's own position. On the title-page they are called " Algazel's Metaphysics " and the single word " translation " is almost the only hint given that they were not originally written in Latin. Otherwise " Algazel " might be a mediaeval European philosopher. The edition is based on a Vatican MS probably of the end of the thirteenth century,

controlled by five Paris MSS and by the Venice print of 1506. The Vatican MS is markedly superior, but full variants are given from two of the Paris MSS. The qualification " almost " above refers to two little notes in Appendix B which gives " Variants and Marginalia." The first of these, p. 241 a, referring to the Latin text, p. 158, l. 6, is correct. The Arabic, p. 269, l. 7, does give *ka-l-quṭuni-l-mandūfi*, " like carded cotton." But the second, p. 247 a, referring to the Latin text, p. 193, l. 8, and suspecting the Arabic word *jinnī* in a corrupt passage, is wrong. The Arabic p. 31 b, ll. 9-11, can be translated : " so often it (*or* he) presents to the sense (apparently the *sensus communis*) the form of the thing feared until he witnesses and sees what he fears, and on account of this a timid coward sees terrible forms, and this is the cause of the speech in desert places of which there is talk and of what is heard of its language."

Finally, it is greatly to be desired that Fr. Bouyges will carry out his promise of 1927 and give us in the " Bibliotheca Arabica Scholasticorum " a thorough edition of the *Maqāṣid*. Professor Muckle has now made accessible the Latin version of more than three-quarters of the Arabic text—246 pp. out of 320—and provided one of the necessary preliminaries to that task.

(Hartford, Conn.) D. B. Macdonald.

The invention of the decimal fractions and the application of the exponential calculus by Immanuel Bonfils of Tarascon (c. 1350)

Preface

After writing my Query no. 58 " The views of Immanuel Bonfils of Tarascon (fl. c. 1340-77) on decimal fractions? " (*Isis*, 25, 132), I wrote to the Bibliothèque Nationale of Paris to obtain a photostat of Hebrew Ms. 1054.6. Within a few weeks I duly received it, and for this I beg to express my thankfulness to the " Office de documentation " so ably managed by the " Société des amis de la Bibliothèque Nationale et des grandes bibliothèques de France."

As soon as the precious photostat had reached me I sent it to Dr. Solomon Gandz of New York together with a copy of my query. Dr. Gandz perceived at once the importance of the document and prepared an edition and English translation of it which it is our privilege to publish below.

True enough, Immanuel Bonfils is a forerunner of Nicholas Chuquet (fl. Lyon 1484) rather than of Stevin. The latter's immense progress consisted in the establishment of a decimal symbolism and of a correct interpretation of it. Stevin's symbols were awkward, but his interpretation so nearly perfect that the awkwardness was overlooked and gradually overcome. Moreover a poor symbolism, if rationally and consistently employed, is infinitely better than none.

It is extremely interesting that the streams of thought which led eventually to decimal calculations on the one hand and to exponential calculations and logarithms on the other, had appa-

rently two main sources, a Christian one and a Jewish one —both being ultimately derived from the same Greco-Arabic fountain head. The Christian tradition is well known; the Jewish less so. In my paper on "The first explanation of decimal fractions and measures" (*Isis*, 23, 153-244, 1935) I had already insisted on two important links of it, to wit, MORDECAI COMTINO (died Constantinople, c. 1487) and ELIJAH BEN ABRAHAM MIZRĀḤĪ (died Constantinople c. 1525). Ahead of these two Jewish links we are now able to place a third one more than a century earlier: IMMANUEL BONFILS (died after 1377).

I shall discuss the mathematical value of IMMANUEL's work in volume III of my *Introduction to the history of science* (to appear in 1938?) and place it there in its proper background. For the present it will suffice to extract a few biographical data from my manuscript.

IMMANUEL BEN JACOB BONFILS was a mathematician, astronomer, astrologer, and a translator from Latin into Hebrew. He flourished c. 1340-1377, mainly in Tarascon, also in Avignon and Orange; he made astronomical observations and taught mathematics in 1377. Whatever fame he enjoyed has been due thus far to his astronomical tables, *Kanfe nesharim* (wings of eagles), divided into six parts and hence also called *Shesh kenafayim* (six wings) and better known under that title. On account of those tables IMMANUEL was often nicknamed *Ba'al kenafayim* (master of the wings). Their main purpose was to help in determining the Jewish calendar. Their popularity is evidenced by the existence of many Mss., some of them including extensions to later times (even to the end of the fifteenth century). Moreover they were translated into Latin (1406) and commented upon in Greek by one of IMMANUEL's contemporaries, GEORGIOS CHRYSOCOCCES.

The Greek commentary is accounted for by the fact that the *Shesh kenafayim* was well known in Qaraite circles, witness the existence of Qaraite Mss. with notes indicating how to adjust the Tarascon tables for use in Constantinople and the Crimea. Now the Qaraites were often in contact with Greeks, and most of them (certainly the educated ones) were themselves Greek-speaking. Indeed the Qaraite community constituted a natural link between Israel and Byzantium.

It is not necessary to speak of his other works, but it is a

strange irony of fate that the least known of them all, the *Derek* (1) *ḥilluq*, the short Ms. mentioned in my Query, will now become, thanks to GANDZ's edition and translation, the main foundation of his fame. We may safely predict that it will be remembered and discussed in the future while the *Kanfe nesharim* will be gradually neglected. We need no longer call their author *Ba'al kenafayim* but rather *Ba'al shevarim 'asiriyyim*.

IMMANUEL BONFILS was barely quoted by D. E. SMITH (2); he was not mentioned at all by MORITZ CANTOR and JOHANNES TROPFKE. GANDZ and I have now placed him—and forever—among the great mathematicians of the fourteenth century, in the company of ORESME and JOHN OF MEURS. Henceforth the city of Tarascon should not remind us only of the famous TARTARIN but also of one of the great mathematicians of the Middle Ages, the Provençal Jew, IMMANUEL BEN JACOB BONFILS (3).

Cambridge, Mass.
August 7, 1935. GEORGE SARTON.

I. — INTRODUCTION

I. Introduction.
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(1) I write *derek*, not *derekh* like GANDZ, simply because I always represent the Hebrew letter *kaf* by the same Latin letter.

(2) *History of mathematics* (vol. 1, 241, 1923). Apropos of the tables and of a treatise on the astrolabe; no reference to decimal fractions.

(3) For other distinguished members of the Jewish community of Tarascon (Ṭarasqon) see HENRY GROSS : *Gallia judaica* (p. 248-50, 1897).

1. *Discovery of the Ms.*

The initiative to this article was given by Dr. GEORGE SARTON, who, at the end of July 1935, sent to the writer the manuscript of his Query no. 58, together with the photostat copy of Ms. Hebrew 1054.6 of the National Library of Paris and an invitation to examine it and report about it. A glance at the manuscript revealed that it really contained a short but thorough and, to our present knowledge, the earliest discussion of the decimal fractions and of the application of a unified exponential calculation to the fractions as well as to the integers. It appeared therefore indicated to arrange for an edition and discussion of the document in *Isis*.

SARTON's attention to the Ms. was called by a line of NEUBAUER and RENAN (4) stating that it contains a " note sur les chiffres décimaux, désignant des nombres entiers ou des fractions." This means in English : " a note on decimal *numerals*, indicating integers or fractions." This description is wrong and gives no sense at all, neither in French nor in English. Firstly, BONFILS does not refer to numerals at all, and secondly, the application of our numerals to fractions does not make any difference in their nature. 1/4, or 2/5, or 3/7, etc., no matter by which numerals they are represented, remain common fractions just the same. Fractions become decimal only, if the decimal scale is applied to them. As a matter of fact the description was verbally taken over from ZOTENBERG's Catalog of the Hebrew Mss. of Paris (5). Apparently ZOTENBERG had grasped the meaning of the text in a philological way, but his mathematical understanding and power of expression were inadequate.

Still less adequate was the understanding of the Hebrew copyist of the Ms., who inscribed this page with the words : *Derekh ḥilluq le-Rabbi Immanuel we-'inyanim'aḥerim.* " A method of division by Rabbi IMMANUEL, and other topics," which title betrays complete ignorance. The copyist simply noticed that the first line reads : " Know that the unity is divided into ten parts," and

(4) *Ecrivains juifs français du XIV^e siècle*, 1893, p. 694.

(5) *Catalogues des Manuscrits Hébreux de la Bibliothèque Impériale*, Paris, 1866, p. 193, no. 1054. 6.

so he mechanically rendered it as " a method of division." Then he realized that other subjects are also discussed, so he added to it: " and other topics." ZOTENBERG recognized that this Hebrew title is wrong and misleading, and he tried to give a better description, but his attempt also remained a failure. ZOTENBERG may perhaps have thought of *nombres décimaux*, which like the *Nombres de Disme* of Stevin and the German Dezimalzahlen (6) may have been used by some French schoolbook for the decimal fractions, but he certainly expressed it in a very awkward manner. The fact remains that none of the scholars who read this note grasped its meaning. RENAN and NEUBAUER simply copied ZOTENBERG's words without understanding them. STEINSCHNEIDER in his essay on BONFILS (7) copied RENAN and NEUBAUER, but he realized that the words " désignant des nombres entiers ou des fractions " have no meaning, hence he omitted them and said only: " Weg der Teilung, ueber Dezimalziffern." He thus combined two entirely wrong, misleading and contradictory descriptions, the one due to the Hebrew copyist and the other to ZOTENBERG. The writer in *The Jewish Encyclopaedia* (III, 306) has: " Way of Division, notes on decimal numbers "; he copies STEINSCHNEIDER, but the decimal numerals become decimal numbers. Finally, the last authority, the writer of the article on BONFILS in the *Encyclopaedia Judaica* (IV, 945), says: " Derech Chilluk, der Weg der Division." He copies the *Jewish Encyclopaedia*, but omits the decimal numbers which have nothing to do with division. Unknowingly, he thus reverts to the oldest description, that of the first Hebrew copyist. The last link reaches the first one and closes the circle of errors, behind which BONFILS's ingenious invention of the decimal fractions remains hidden.

Now it so happened that GEORGE SARTON, after having published his elaborate study on the history of the decimal fractions (8) and in the course of his preparation of the essay on BONFILS for the 3rd volume of his *Introduction to the History of Science*, stumbled upon this strange note of ZOTENBERG, as quoted by

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(6) See below, § 6, p. 32, note 45.

(7) *Bibliotheca Mathematica*, 1898, pp. 79-87; see p. 85 *ib.*

(8) In *Isis*, vol. 23, 1935, pp. 153-244.

RENAN and NEUBAUER. The idea thus came to him that this note, if it is to have any meaning at all, can only refer to the decimal fractions. Then another very fortunate idea came to him, namely to order a photostat copy of the Ms. and to invite its examination. The credit for the discovery of the Ms. is therefore, in the writer's opinion, due to SARTON, who from an erroneous description of the document guessed its real contents.

The Ms. Hebr. 1054.6 consists of 7 pages, folio 28 r°-31 r° inclusive. The first six pages, folio 28 r°-30 v°, contain an astronomical treatise on the middle course of the planets, called *Be'ur mi-luḥot*. The last page, folio 31 r°, having fifty lines in a very small script, contains the short note on the decimal fractions and a few other arithmetical rules, which the copyist inscribed as *Derekh ḥilluq* etc. The Ms. indicates five sections by indentation. I divided it into six paragraphs, splitting into two paragraphs the last section, dealing with the magnification of numbers for purposes of division and root extraction. The headings, as listed in the table of contents, are added by me. Only the first three paragraphs deal with the new theory of the decimal fractions (9).

2. BONFILS' *invention*

The invention of BONFILS introduces two new elements: the decimal fractions and the exponential calculus. In the latter case he substitutes the addition and subtraction of the exponents, or of the denominators of the degrees, as BONFILS calls them, for the multiplication and the division of the decimal powers. Our impression is that BONFILS is primarily interested in the demonstration of this method of the exponential calculus. The decimal fractions are only introduced in order to obtain a unified scale of powers which will facilitate the calculation with the exponents. Not a word does BONFILS say with regard to the practical value of the transformation of the common fractions into decimals. On the other hand, SIMON STEVIN in his *De Thiende*, or *La Disme* (10), stresses mainly the practical significance of the decimal fractions, and he uses the expon-

(9) See below, § 6, p. .

(10) Published in 1585. See SARTON in *Isis* (1935), p. 153 ff.

ential calculus only partly, as an additional means for their computation.

BONFILS' theory of the exponential calculus is much more developed than STEVIN's. In order to obtain the symmetrical arrangement of the decimal powers, so that the positive exponents of the integers shall correspond to the negative exponents of the fractions, he has to divide all the numbers into three classes: integers, fractions and units. The integers begin with the tens, which are the Primes, the first degree; the hundreds are the Seconds, the thousands the Thirds and so on. The corresponding degrees among the fractions are the tenths as the Primes, the hundredths as the Seconds and so forth. Hence the integers and the fractions are, to BONFILS, the decimal numbers proper, this is: they contain the factor ten, as a multiplier or as a divisor, with a positive or with a negative exponent. The nine units, however, are not decimal numbers at all. The class of the units is regarded by BONFILS as a kind of boundary, standing in the middle between the integers and fractions. The ancient Greeks called them the *pythmenes*, the bases, and JAMBLICHUS (c. 325 A.D.) called them *monades* (11). This latter designation was adopted by BONFILS. In our modern way of writing them as $a(10^0)$, the factor ten is—so to say— smuggled in by a device of our symbolism. If we translate the symbol zero of the exponent into words, then it means, factor ten is not extant. Since BONFILS used no symbols, he had to say plainly that the units do not belong into the decimals proper, they have no degree, or their degree is zero. Accordingly he says (§ 1): "If you deduct the denominator of the Seconds from the denominator of the Seconds, *nothing* remains, and it falls into the degree of the units."

The symbol zero has also the significance of a boundary or intermediate between the positive and the negative numbers. And similarly BONFILS defines the class of the units as "an intermediate, or boundary, between the integers and the fractions." This again reminds us of the definition of the unit attributed by JAMBLICHUS to some of the PYTHAGOREANS. According to this definition (12), "an unit is the boundary between number and

(11) See TROPFKE, *Geschichte der Elementar-Mathematik*, I², p. 73.
(12) See HEATH, *Euclid's Elements*, II¹, p. 279.

parts, because from it, as from a seed and eternal root, ratios increase reciprocally on either side," i.e., says HEATH, " on one side we have multiple ratios continually increasing and on the other submultiple ratios with denominators continually increasing." Now exactly the same is the case with the whole *class* of the units in relation to their decimal multiples and submultiples. Hence BONFILS is applying the same definition to the class, or degree, of the units.

Another specific feature of the unit is the fact that it does not cause any change in the numerical value of another number multiplied by it. THEON OF SMYRNA (c. 125 A.D.) explains the etymological signification of the word *monas* to be " that it remains unaltered if it be multiplied by itself." (13) IBN EZRA (c. 1150) once remarks (14) that, when squared, the integers increase and the fractions decrease. The unit, however, as " standing in the middle between the integers and fractions," remains the same in root and square. BONFILS finds the same characteristic in the whole class of the units, as regards their degree, and gives the same reason for it (§ 1). If you multiply integers or fractions, the degrees are added. But if you multiply the units, " standing in the middle between integers and fractions," the degree remains the same.

3. *The History of the Exponential Calculus*

The older mathematicians ascribed the degree one to the units, the degree two to the tens, and so on. This was already expressed by ARCHIMEDES (287-212 B.C.) and APOLLONIUS (c. 225 B.C.), who arranged the numbers in octads, respectively in tetrads, in which the units occupied the first rank (15). According to the older mathematicians, therefore, the place of the product of two degrees was indicated by the sum of the degrees of the

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(13) See HEATH, *loc. cit.*; *Nicomachus of Gerasa*, ed. D'OOGE, ROBBINS and KARPINSKI, pp. 100, 238 and 256.

(14) In his *Sefer ha Mispar*, chap. VII, p. 61.

(15) The degrees were later called *ordo*, *limes*, or *differentia*. The Hebrew terms were *ma'alah* or *madregah*, and the Arabic ones were *martaba* or *manzil*; see f.i. *Algoritmi de numero Indorum*, p. 3; AL-KARKHĪ, *Kāfī fil Ḥisāb*, I, p. 4 f.; GANDZ, " The Origin of the Ghubar Numerals " in *Isis*, vol. 16 (1931), p. 402 ff.

factors minus one. For instance 100 times 1000 is 100.000. The degree of 100 is 3, and that of 1000 is 4; 3 plus 4 minus 1 is 6, which is the degree of 100.000. The innovation of BONFILS consisted in the fact that he ascribed no degree to the units. As a result the degree of the product is equal to the sum of the degrees of the factors, and the degree of the quotient is obtained by the subtraction of the degree of the divisor from the degree of the dividend. Thus BONFILS was not only the first to introduce the decimal fractions, but also the first to apply to the decimals, integers as well as fractions, the fundamental law of the logarithm, reducing multiplication and division to the operations of addition and subtraction, and NAPIER's invention did not come to the world " as a bolt from the blue." (16)

In a sense, it was already ARCHIMEDES who came pretty near to the discovery of this rule, as justly remarked by SMITH (17). In his SAND-RECKONER he says (18): " If any two terms as *Am*, *An* be taken and multiplied, the product *Am.An* will be a term in the same series and will be as many terms distant from *An* as *Am* is distant from *A1*; also it will be distant from *A1* by a number of terms less by one than the sum of the number of terms by which *Am* and *An* respectively are distant from *A1*." GEORGE SARTON called my attention to the fact that the rule was implicitly known also to EUCLID (19). Implicitly of course, the correct form of the rule (20) was taught by DIOPHANTUS, who, in the introduction to his *Arithmetica*, gives the rules for the multiplication and division (the multiplication by the reciprocal $\frac{1}{x}$) of the powers up to x^6. It is characteristic that DIOPHANTUS based the terms and symbols for the higher powers on the addition of the exponents. Thus the fifth power, f.i., is called Dynamo-Kybos ($x^5 = x^{2+3}$). This Diophantine method is also followed by AL-KARKHĪ (c. 1010) in his *Fakhrī* and by ABŪ KĀMIL SHUJĀ', while the Arabic terms in general are based on the multiplication

(16) See SMITH, *History of Mathematics*, II, pp. 514, 518 ff.

(17) *Loc. cit.*, I, p. 113.

(18) I am quoting from the English translation of HEATH, *The Works of Archimedes*, Cambridge, 1897, p. 229. For the Greek text see the edition of HEIBERG, II, p. 241 f.

(19) *Elements*, IX, 11; cf. ed. HEATH, II, p. 396.

(20) $a^m.a^n = a^{m+n}$.

of the exponents. Whereas the addition of the exponents is derived from the Greek sources, the multiplication of the exponents is said to go back to the Hindus (21).

Now this above mentioned rule of ARCHIMEDES had the form $a^m.a^n = a^{m+n-1}$, and in this somewhat awkward form it was still applied by JOHN OF MEURS (14th century) (22). For the multiplication he has $a^m.a^n = a^{m+n-1}$, and for the division the rule is $a^{m+n} : a^m = a^{n+1}$, or to increase in advance the degree of the dividend by one (a^{m+n+1}) and to subtract the denominator of the divisor. NAGL, however, is thoroughly mistaken when he says that this rule of the *Arenarius* became "verschollen," fell into oblivion, during the Middle Ages. It was not the mediaeval mathematicians who became oblivious of ARCHIMEDES' rule, but it was the modern historians who became oblivious of the mediaeval mathematicians. Thus we find the rule expounded by JOHN of SEVILLE, or JOANNES HISPALENSIS (23) (c. 1140), by ABRAHAM SAVASORDA (c. 1100) (24), by IBN EZRA (c. 1150) (25), and by LEVI BEN GERSHON (1288-1344) (26).

As regards the sexagesimal fractions, the main rule for the multiplication, in its precise form ($1/a^m.1/a^n = 1/a^{m+n}$), may be traced to the arithmetic of AL-KHUWĀRIZMĪ (c. 825), called *Algoritmi de numero Indorum* (27).

Unfortunately the text is corrupt and the relevant passage is not so easy to understand. The text reads: *Minuta quoque in minutis erunt secunda; et secunda in secundis tercia; et tercia in*

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(21) See HEATH, *Diophantus of Alexandria*, 2nd ed., Cambridge ,1910, p. 40 f.; TROPFKE, *loc. cit.*, II², pp. 130 f.; 3rd ed., p. 134; JOSEF WEINBERG, *Die Algebra des Abū Kāmil Shojā*, 1935, p. 9.

(22) In his *Quadripartitum numerorum* (c. 1343), chaps. 11 and 14. See NAGL in *Abhandlungen zur Geschichte der mathematischen Wissenschaften*, V, pp. 140-41, 143-5.

(23) In his *Liber Algorismi de pratica arismetrice*, p. 116. Cf. below, p. 26, note 30 about this book.

(24) In his Hebrew *Encyclopaedia*, MS. Munich, Cod. Hebr. 36, f. 204*b*-205*a*.

(25) In his *Sefer ha Mispar*, pp. 5-6 and 79-80.

(26) In his *Sefer ma'aseh ḥosheb*, ed. LANGE, pp. 55-56; see also note 41 on p. 135, *ib.*

(27) P. 18. It was published by BONCOMPAGNI, *Trattati d'arithmetica*, I, Rome, 1857.

terciis quarta; et quarta in quartis quarta. This should be emended into: *et minuta in secundis tercia; et minuta in terciis quarta; et minuta in quartis quinta.* The subsequent passage reading: *quare coniunctis utrasque differentias quas multiplicas invicem; et quod colligitur ex numero fractionum simile ei quod exit de numero integro in invicem multiplicato,* can have only one sense, and this is: " For both degrees of the fractions, which you are multiplying into each other, are to be added. And the degree represented by the sum is the same as that which results from the multiplication of the integer numbers in the denominators." This meaning is further illustrated by the subsequent examples in which it is pointed out that minutes multiplied by minutes give seconds, for 1/60.1/60 = 1/3600; minutes by seconds give tertiae, for 1/3600.1/60 = 1/216.000.

This conception is fully corroborated by the corresponding passage in JOANNES HISPALENSIS, *Liber Algorismi de pratica arismetrice*, p. 50 (28). For this treatise of JOHN of SEVILLE (fl. c. 1135-53) is not simply " a Latin translation of an unknown Arabic original " (29), but a free paraphrase, or development, of AL-KHUWĀRIZMĪ's arithmetic, or, perhaps, a Latin translation of an Arabic paraphrase of the same book (30). Strangely enough, AL-KHUWĀRIZMĪ does not know that the corresponding rule for the division is $a^m : a^n = a^{m-n}$. On p. 20 of the above mentioned

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(28) Edited by BONCOMPAGNI in *Trattati d'arimetica*, II, Rome, 1857.

(29) As SARTON, *Isis*, 23, 1935, pp. 169, 203, says.

(30) As SARTON in his *Introduction*, I, p. 563, and II, p. 169, correctly says. It should be noted, however, that this paraphrase extends only from p. 25, which is the beginning of the book, till p. 93. From there to the end various fragments and excerpts of unknown authors are given, so that SARTON's remark in *Isis* fits well to this second part of the *Liber Algorismi*. The *Algoritmi de numero Indorum* is only a torso. The chapter on the division of fractions is not complete, and the chapter on root extraction, premised on p. 17 *ib.*, is entirely missing. JOHN of SEVILLE in his *Liber Algorismi* preserved the whole treatise, and the text of his book came down to us in a better shape than that of the *Algoritmi*. It is therefore very helpful in ascertaining the text and meaning of the *Algoritmi*. From about p. 57 till p. 93 the missing part of the *Algoritmi* is preserved. Hence if one finds something in JOHN of SEVILLE's treatise, on pp. 25-57, he may be sure to find it in the *Algoritmi de numero Indorum*, and if a passage of pp. 57-93 is quoted, it is very safe to assume that it comes from the lost part of the *Algoritmi*. In both cases it is indicated to refer to AL-KHUWĀRIZMĪ (c. 820) rather than to JOHN of SEVILLE (c. 1150) as the authority. See also below, note 65 at the end of the paper.

treatise he recommends the method of reducing both, the dividend and divisor, to the same degree of the sexagesimal fractions, and the result will be an integer number (31). But if the dividend happens to be smaller than the divisor, AL-KHUWĀRIZMĪ is almost helpless and has to use a very complicated and awkward procedure. And yet AL-KHUWĀRIZMĪ's method constitutes a great progress in comparison with the clumsy ways of THEON of SMYRNA (c. 390 A.D.) (32). In the paraphrase of JOHN of SEVILLE, however, (p. 53) AL-KHUWĀRIZMĪ's rule is given in a somewhat more clear and perfect form (33).

The exact rule for the multiplication of the sexagesimal fractions ($1/a^m . 1/a^n = 1/a^{m+n}$) is also to be found in the Algorismus of the 12th century, also called *Liber ysagogarum Alchorismi*, written between 1163-1168, and supposed to be an elaboration of AL-KHUWĀRIZMĪ's work by ADELARD of BATH (fl. 1116-1142) (34); in IBN EZRA's *Sefer ha-Mispar*, pp. 42-3; in LEVI b. GERSHON's *Ma'aseh ḥōsheb*, p. 56, and in MIZRĀḤĪ's (d. 1525) *Sefer ha Mispar*, I, 1, 2; f47ff. LEVI B. GERSHON expressly states that the rule for the fractions is a^{m+n} and not a^{m+n-1}, because in the degrees of the fractions the units are not included. AL-KARKHĪ (c. 1010), however, goes one important step further, as he gives both the

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(31) Read *minuta* instead of *secunda* on p. 20, line 2 from the bottom, and on p. 21, lines 1 and 10 from the top.

(32)See about the way he divides 1515° 20' 15" through 25° 12' 10" HALMA's edition of his Commentary, I, pp. 110-119, 185-86, quoted by CANTOR, *Geschichte der Mathematik*, I³, p. 493-4.

(33) He says that in dividing seconds through minutes we receive minutes. For the ratio of dividend to divisor is like the ratio of the quotient to one. The text *ib.*, p. 53, lines 6 and 4 from the bottom, has to be emended into : " *Si autem [non] poteris dividere minuta per minuta... et sic divides [secunda per minuta]*. This is the elaboration and explanation of the obscure phrase : *et hoc est quod debetur uni*, in the *Algoritmi*, p. 20, line 2 from the bottom, and p. 21, lines 6, 9, 16 from the top. It means that the quotient is the share due to one, or mathematically, if $a : b = c$, then $a : b = c : 1$. In Arabic these words read : *fa-hūwa ma yaṣību-l-wāḥid*, which phrase occurs in AL-KHUWĀRIZMĪ's *Algebra*, p. 20, lines 3 and 5 from the bottom. ROSEN did not understand this somewhat enigmatic phrase and, therefore, omitted it in his English translation.

(34) The anonymous Algorismus was edited, partly, by CURTZE in *Abhandlungen zur Geschichte der Mathematik*, VIII, 1898, pp. 3-27; see pp. 12 and 21 *ib.* For the authorship of ADELARD see SARTON, *Introduction*, I, p. 563; II, p. 167 f. The contents of the treatise closely resembles that of JOHN of SPAIN's *Liber Algorismi*.

rules for the multiplication and division of the sexagesimal fractions (35). AL-KARKHĪ first uses the phraseology of ARCHIMEDES. In explaining the rule for multiplication, he says that the degree of the product is removed from the one factor like the distance of the other factor from the unit. But then he improves his formulation by saying that one should add the numbers of the degrees for the multiplication and deduct them for the division. BONFILS goes still further and says that one can arbitrarily reach any degree of accuracy in the quotient. If the divisor is a^m and you want to obtain a^n in the quotient, then you have to magnify the dividend into the degree a^{m+n} (36).

We have thus seen that in the calculation with integers and fractions two sharp inconsistencies had developed. In first line there were two different scales or bases. The decimal scale for the integers, and the antiquated sexagesimal scale, a relic of old Babylonian mathematics, for the fractions. In second line there were also two different methods of exponential calculation. The clumsy, antiquated formula : $a^m.a^n = a^{m+n-1}$, for the integers, and the correct, classic formula : $a^m.a^n = a^{m+n}$, for the fractions. This improved rule had nothing to do with the sexagesimal scale, but was due to the fact that, of course, among the degrees of the fractions the units were not counted, hence the degrees of the fractions were identical with the exponents of the sexagesimal powers. Among the integers, however, the units had to be counted as the first degree, and this caused the discrepancy between the degrees and the powers of ten, so that degree a corresponded to exponent $a - 1$. This discrepancy was noticed by the Hebrew mathematicians LEVI B. GERSHON (37) and IBN EZRA. The latter expressly and clearly states the fact by saying, at the end of his book (38), that according to *true* arithmetic, *be-ḥeshbon ha-'emet*, the degree one ought to be ascribed to the tens, but that the mathematicians, somehow, did place the units in the first degree " in order to make it easier for the pupils," hence they have to subtract one. It is safe to assume that our

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(35) In his *Kāfī fil ḥisāb*, II, p. 10-11, chaps. 36-37.
(36) See § 5 of the text below.
(37) *Ma'aseh ḥōsheb*, p. 56.
(38) *Sefer ha-Mispar*, p. 80.

author BONFILS was well acquainted with the arithmetical works of IBN EZRA and LEVI B. GERSHON. Pondering over these problems, the idea may have come to him to remove both deficiencies and difficulties with one device. By introducing the unified decimal scale for both integers and fractions alike, the degrees had to be determined in a more harmonious way, so that the decimal multiples may correspond in their position to the decimal submultiples. The units thus came to occupy the middle, boundary position between the integers and fractions, and had to receive the degree zero. As a result BONFILS was enabled to establish the correct and unified exponential calculus for both the integers and fractions, and to anticipate the fundamental law of the logarithms.

4. BONFILS' *Method of Presentation*

In presenting his new theory BONFILS follows the usual mediaeval method, which consists in giving the rule of procedure without explaining its reason or its underlying principle. The mediaeval mathematicians like to present their theories and methods as if they were divine revelations or traditions of the ancestors, which the student has to accept as a faithful believer. He is simply told, as AL-KHUWĀRIZMĪ once said (39): "Proceed, or operate, according to this rule, and you will succeed with the help of God, may he be exalted." In this special case of ours the impression is made upon us, as if BONFILS would deliberately try to conceal rather than to reveal the underlying principle of his procedure. There can be no doubt about it that his whole method is based upon the following three principles: (1) The integers have a positive and the fractions a negative exponent; (2) Multiplication may be reduced to the addition, and division to the subtraction of the exponents; and (3) The well known (40) law of the operation with negative numbers, according to which two similar signs give a positive and two dissimilar signs give a negative number. However, not with one word does BONFILS

(39) *Algebra*, Arabic text, p. 21, line 4. Omitted in the English translation.

(40) Known to DIOPHANTUS (c. 250-300 A.D.); see the introduction to his *Arithmetica* and HEATH, *Diophantus*, 2nd ed., p. 130. Known also to AL-KHUWĀRIZMĪ; see his *Algebra*, pp. 15 and 19. Cf. also TROPFKE, *loc. cit.*, II², p. 91.

allude to these laws and principles. He gives instead a number of complicated rules of thumb which may rather becloud the fundamental principles. In all likelihood, they are intended to be memorized and followed, mechanically, but not to be clearly understood. Hence we may declare that the theory of the positive and negative exponents, or denominators, was certainly known to BONFILS, but that he did not teach it explicitly. It may be that he did not want to divulge it and preferred to keep it as a secret of his own. The systematic development of the calculus with negative and fractional exponents is not older than the 18th century, though occasionally fractional exponents were already employed by NICOLE ORESME (c. 1323-1382) (41).

5. *The Two Sections of the Ms.*

The Ms. before us does not contain one text of coherent unity, but consists of two fragments representing two different stages in the arithmetical thinking of BONFILS. Apparently, the copyist of the Ms. had put down on the one page, folio 31 r°, two various notes, which BONFILS may have jotted down at different times on two different sheets of paper, but has kept them together as belonging to a related subject (42). The first three paragraphs contain the new theory with the new terminology. The last three paragraphs, however, have nothing to do with the new invention. On the contrary, they obviously still belong to the earlier stage, teaching the old conceptions and methods.

Thus § 4 still characterizes the units as the first degree and the tens as the second one, and still states that the squares 1, 4, 9 recur in all the degrees of the integers which are denoted by *odd* numbers. According to the new theory BONFILS would have to say that these squares are to be found in the *even* numbered degrees of the integers as well as of the fractions (43). In §§ 5-6 he deals with the sexagesimal fractions, speaking of " grades, *daqqim* (i.e. minutes) and seconds," or also of „grades, primes and seconds." Apart from that, he does not mention the addition

(41) Cf. TROPFKE, *loc. cit.*, II², p. 132.

(42) On various redactions of BONFILS' notes and works see RENAN-NEUBAUER, *Ecrivains juifs*, pp. 694, 696 and 698.

(43) See below, II, § 4, p. 4.

of the exponents, but still uses the old phraseology, going back to EUCLID and ARCHIMEDES. He advises to break up the dividend into a degree, " which is removed from the divisor as the quotient is from the grades," respectively, to break up the square into such a degree, " which is removed from the root as the root is from the grades." However, these paragraphs are interesting insofar as they demonstrate that BONFILS' mind was occupied with such subjects and methods of calculation. He started with the old traditional methods and finished by inventing the new improved method.

6. BONFILS *and* STEVIN

BONFILS' theory was jotted down on a piece of paper, in Hebrew language, and put away. There it remained buried for about six centuries. The old Hebrew copyist failed to grasp its meaning. The modern cataloguer ZOTENBERG described it very awkwardly, and so his copyists failed to understand him. Thus BONFILS' invention exercised no influence on his contemporaries or successors, though otherwise it seems that he was well known to Christian scholars. He was referred to as MANUELE DOTTORE EBREO, and PICO DE LA MIRANDOLA once quotes him as EMANUEL EBRAEUS ABENESRAE sectator (44). However, to our knowledge, there is no trace of a connection between the Dutch engineer STEVIN, who published the first exposition of the decimal fractions in 1585, and the French Jewish astronomer of the 14th century. And indeed a comparison of their treatises reveals too numerous and too deep differences both in their conception of the new theory and in their way of expressing it.

BONFILS is primarily interested in the development of the theory of a unified and consistent exponential calculus, for integers and fractions alike, and for this purpose the decimal base is extended

(44) See STEINSCHNEIDER in *Bibliotheca Mathematica*, 1898, p. 87. There can be no doubt about it that ELIJAH MIZRĀḤĪ knew of BONFILS and of his famous *Kanfe nesharim*. Here again I am in a position to corroborate by positive evidence SARTON's conjecture, in his above quoted Query no. 58. MS. Hebr. 688 of the National Library of Paris, which contains the *Moreh Nebukhim* and a fragment of the *Kanfe nesharim*, or *Shesh kenafayim*, comes from the library of MIZRĀḤĪ; see ZOTENBERG's Catalog,p. 109. But in his *Sefer ha-Mispar* MIZRĀḤĪ betrays no knowledge of BONFILS' theory concerning the decimal fractions and the exponential calculus.

into the field of the fractions. What STEVIN has in mind is the introduction of a unified and consistent decimal system for practical purposes. The old traditional way was to divide the numbers into two classes, integers and fractions. Both, BONFILS and STEVIN alike, deviate from this old tradition. BONFILS introduces the third class of the units, while STEVIN wants to have one class of Decimal Numbers only, the *Nombres de Disme*, without any distinction between the integers and fractions. But in abandoning the old bipartition, BONFILS and STEVIN have different aims in view which lead them towards opposite goals. BONFILS does not want to reject the old tradition. On the contrary, he wishes to make the division more perfect and more consistent. He wants to build up a dualistic system in which the decimal exponents of the integers correspond to the decimal exponents of the fractions, and in which the degrees correspond to the decimal powers. Therefore he is compelled to establish for the units the exponent zero, as an intermediate between the positive and the negative powers. STEVIN, on the other hand, boasts of the fact that he is introducing a new system of arithmetics in which there are no fractions at all, in which the classes of the fractions and integers are entirely abolished. STEVIN rejects the old tradition, he wants to have no symmetric dualism, but a unified monistic system.

However, STEVIN well succeeded in abolishing the symmetry, but he failed to establish the promised monism. There is a deplorable lack of consistency in his definitions, as well as in his terminology and symbolism. In his first definition STEVIN proudly announces that he has invented a new system of arithmetics by which the fractions are done away with and by which all the calculations may be executed through integers only. This is partly true, since he is able to dispense with the traditional form of the common fractions (a/b). STEVIN, however, insists upon the claim that in his new arithmetic there is only one kind of numbers comprising both integers and fractions, for which, in his fourth definition, he coins the new term *Nombres de Disme*, Decimal Numbers (45). Very scrupulously he tries to avoid any reference to integers or fractions. And

(45) A few German mathematicians imitated this term by the German word "Dezimalzahlen" for the decimal fractions; see TROPFKE, *loc. cit.*, I², p. 145, and cf. above § 1, note 6.

yet he soon finds out that he has to distinguish between them, and thus he calls the integers the *nombre proposé*, " the antecedent number," or *commencement*, " beginning," and gives them the symbol of the zero (0). For the fractions he has no general term at all, but he says that the decimal parts of the units of the *commencement* are named *primes*, the decimal parts of the units of the *primes* are *seconds* and so forth in infinity (46). Instead of the clear and precise terms " integers and fractions," we have a vague, inconsistent and utterly confusing classification of *commencements* on the one hand, and primes, seconds and thirds on the other hand. Whereas the fractions are divided into their decimal powers, of which each forms a special class or degree that is denoted by a special symbol, the integers are all thrown into one pot, having only one class and one symbol. Thus the clumsy symbolism fits to the awkward classification. And still we must say with SARTON that " a poor symbolism is infinitely better than no symbolism at all." This latter characteristic „no symbolism at all," is the great defect of BONFILS' perfect theory. BONFILS has no notation whatsoever. But for a few examples, in which the letters of the Hebrew alphabet serve as numerals for the integers, everything is put in words. He still belongs into the antiquated stage of rhetoric algebra.

Now if we ask us how did it come that the practical and clearminded STEVIN introduced such an illogical classification and notation, the answer is that they were not invented by STEVIN but taken over from an earlier system. STEVIN's classification and notation are an historical and traditional relic from the old system of the sexagesimal fractions, which he adapted to the new system of the decimal fractions. The fact is that to STEVIN the integers and decimals step into the place of the grades and the sexagesimals. In the old system of the sexagesimal fractions, the grades represented the integers and were not arranged into degrees like the fractions. The grades were characterized by the zero and the degrees of the sexagesimals by strokes or accents (47).

(46) See deff. 2-3 in his treatise.

(47) CAJORI, in his *History of mathematical notations*, II, p. 142 ff., says that the mediaeval manuscripts and early printed books contain, as a rule, abbreviations of Latin words instead of the symbols ° ' " "'. He dates the earliest appearance of the sign ° at 1558 or 1569, as he found it in the 1569 edition of GEMMA FRISIUS'

STEVIN closely follows this symbolism, but instead of the accents he employs the numerals, enclosed in circles, to designate the decimals. Thus in STEVIN's system the number 3625 (0) 3 (1) 5 (2) 6 (3) (48) corresponds to $3625^0\ 3'\ 5''\ 6''$, but it represents 3625.356. Were he to use the accents in place of the numerals, his numbers would have been understood as designating grades and sexagesimals. This apparently is the reason why he had to differentiate. His mechanical imitation of the old symbolism is best demonstrated by the use of symbols for the degrees of the fractions. They are indispensable for the sexagesimal fractions, but they become entirely useless when the decimals are introduced. In the decimal system the zero alone, or some other sign, separating the integers from the fractions, would suffice. Similarly, any symbol designating the value of the first or last cipher would be sufficient (49). The connection between the two systems becomes evident in STEVIN's attempt to apply his new idea to the sexagesimal system. Thus he proposes (50) to call the 360 grades 360 *commencements*, and to divide the grade into ten equal parts, each of which will be again subdivided into ten parts, and to apply to them his somewhat modified symbolism.

STEVIN not only follows the arrangement and symbolism of the sexagesimals, but the operations that he teaches are also almost identical with the methods used by the mediaeval mathematicians for the grades and sexagesimals (51). The rules for

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Arithmeticae practicae methodus, where it occurs in the Appendix on astronomical fractions, due to PELETIER and dated 1558. The accents for the fractions, however, appear already in PTOLEMY's *Almagest*, where the sign $\mu^0 = \mu o\tilde{\iota}\rho\alpha\iota$ is used for the degrees. O. LIPPMAN therefore holds the view that the sign ^{0} is the Greek letter omicron taken from the word *moirai*; see CAJORI, *ib.* This seems to be plausible, as the symbols of the zero and of the accents are to be found already in MIZRĀḤĪ's *Sefer ha-mispar*, II, 1, 2, f. 47*b*, line 21, and f. 48 on both pages. (MIZRĀḤĪ's book has no pagination of the leafs, but the layers of four folios are marked at the bottom). MIZRĀḤĪ's book appeared posthumously in Constantinople, 1532, (*Isis* 23, 173, 226); he died in 1525, but his book may have been written before he assumed the duties of the chief Rabbi of Constantinople in 1495. He may have adopted his symbols from Greek sources.

(48) I am using brackets for the convenience of the printer, but in STEVIN's treatise the numerals are enclosed in circles.

(49) Sometimes STEVIN does make use of the latter means; see SARTON, *Isis* 23 (1935), p. 176.

(50) In article V of the Appendix, facs. 156-7; see also SARTON, *Isis*, 23, p. 199.

(51) For the discussion of the sexagesimal fractions see *Algoritmi de numero*

addition, subtraction and multiplication are the same. For the division, however, STEVIN's rule is more advanced than that of AL-KHUWĀRIZMĪ, but less advanced than that of BONFILS in § 3 of his treatise. It corresponds to the method of AL-KARKHĪ (II, p. 11) LEVI B. GERSHON (*Ma'aseh ḥosheb*, p. 79) and BONFILS in § 5. STEVIN's innovation and radicalism was confined to the one new idea of the decimal system, which he wanted to introduce into the practical life. In all other things he tried to follow, as far as he could, the historical traditions and methods. This accounts for his inconsistencies. After all, one cannot have everything. One cannot combine historical continuity with logical consistency.

Indorum, pp. 17-22; JOHN of SPAIN's *Liber Algorismi*, pp. 49-56; AL-KARKHĪ, *Kāfī*, I, p. 24; II, pp. 10-11; IBN EZRA, *Sefer ha-Mispar*, p. 43 (he says there : " be careful to place a vertical bar between each degree of the fractions); MIZRĀḤĪ, *Sefer ha Mispar*, ff. 47-48.

The Hebrew text

MS Hebr 1054 6 National Library - Paris

דרך חלוק לכ עשרה ועא (ועניים אחרים)

הקדמה

יכדע כי האחד נחלק לעשרה חלקים יקראו ראשונים, וכן כל ראשון חוץ
לעשרה חלקים יקראו שניים וכן לאין הכלית. וכן אמרתי להבדיל כי הנני
קורא למעלות העשרות שלמים ראשונים ומאות שלמים שניים, וכן לאין
תכלית. ואמנם מעלת האחדים אני קורא אותם בשם אחדים, לפי שהוא אמצעי
בין השלמים והשברים, ולזה כשיכפל אחדים באחדים יצאו אחדים וכן אני קורא
למעלות שכל גדולות השם, גדול כשם רצוני בזה שלישיים אני קורא יותר
גדול השם משניים לפי ששלישיים נקנו משלשה ושניים משנים וכן רביעיים
יותר גדול השם משלישיים, וכן המשיים חמשיים, וזה הוא בשלמים ובשברים.
וכן כשאומר חנה שם נה עם שם זה, או גרע שם זה משם זה רצוני בזה, חנה
שם שניים עם שם שלישיים ויהיו תמשיים, ואם שם שניים עם שם שניים יהיו רביעיים.
וכן גרע שם שניים משם שלישיים ושאר כאלו, ואם שם שניים משם שניים לא
ישאו דבר ויפול במעלת האחדים וזה בשלמים ובשברים. וכאשר תגרע שם
גדול משם קטן כאמרנו נגרע רביעיים משניים [הן בשלמים] הן בשברים,
יצוא בתעלת השניים לצד מאחר. כאמרנו נגרע מ רביעיים בשברים משם
שניים גם הן בשברים, יפול בתעלת שלמים שניים. וכן באמרנו זה בשלמים,
ל שנרצה לגרוע שם רביעיים שלמים משם שניים שלמים, יפול בשברים שניים.

§2 —שהכפיל מספר על מספר ושניהם שלמים או שניהם שברים, חבר שם
המדרגות האחד [עם האחר]' ואם הוא הנכפל, בשלמים אם יניהם
שלמים ובשברים אם שניהם שברים ואם האחד שלמים והאחד שברים,
גם שם יום בשם הנה יכפול[2] הנכפל בעלת האחדים. ואם שם האחד
רב על האחר, גרע הקטן מהגדול ומספר בשם שישאר שם יפול הנכפל,

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[1] Added by me. [2] Read יפול.

בשלמים אם - הם' השלמים כיותר גדול או כשברים אם שם השברים הוא
יותר גדול

כשתחלק מספר על מספר ישניהם שלמים או שניהם שברים ושם הדרגותיהם
שוה, כגון יפול-החלוקה בתעלת האחדים לפי שכאשר תגרע שם זה משם זה
לא ישאר דבר ויפול בתעלת האחדים. ואם העליון יותר גדול משם התחתון
גרע שם התחתון תשם העליון וכמספר[2] שם הנשאר יפול ההלוקה בצד
הזה, ר"ל בשלמים אב הוא שלמים או בשברים אם הוא שמים ואם התחתון
יותר גדול גרע שם העליון בשם התחרון, ובמספר שם הנשאר יפול החלוקה
בהפך הצד ר"ל בשברים אם הוין שניהם שלמים, או בשלמים אם הוין שניהם
שברים, ואם האחד שלמים והשני שברים, ושם מדרגותיהם שוה או נתתי שוה,
חבר שם המדרגות, ובמספר שם העולה, בשברים אם העליון שברים או
כשלמים אם העליון שלמים, שם יפול החלוקה.

דע כי בתעלת האחדים יש בה שלשה מספרים מרובעים, ר"ל ששרשיהם
שלמים וידועים, והם: אחד ששרשו אחד, וארבעה ששרשו שנים, ותשעה ששרשו שלשה
ובתעלה השנית שכיא תעלת עשרות אין בה מספר מרובע כלל יען עם חבור אחדים
כי עשרה אינו מספר מרובע ולא עשרים ולא ל' ת נ' ע' פ' צ' אתנם עם
חבור אחדים יש בה שש מרובעים ר"ל שנופף של מספר העשרות אחדים מה, כגון
ין שרשו ד' כ' שרשו ה' לושששרשו ו', תס שרשו ז' וד שרשו ח' פא שרשו
ט' וכל תעלות[3] המספר שמרפר מדרגתה נפיד כמו שלישית, חמשית
רביעית, תשיעית, ודומיהם לאיי רבעית דמי לתעלת האחדים וישבהם גם כן
שלשה מרובעים כמו שיש בתעלת האחדים דמיון: ותעלת במאות יש ג מרובעים
דומים אל תעלה הראשונה, והם: ק' שהוא דומה למרובע א' ושרשו י' שהוא כמו
אחד, וכן ד' תאות שדומה למרובע ד', ושרשו גם כן דומה לשורש ד' שהוא ב',
לפי ששרשו עשרים. וכן תמצא התעלות האחרות שיהיו נפרדים

כאשר תרצה לחלק חשבון מתעלות ודגים ושניים על חשבון אחר יותר קטן או
יותר גדול תקח חשבון אשר תחתון, והוא החשבון אשר עליון יחלק, חשבון

[1] Read שם. [2] Read ובמספר. [3] Read תעלת

בשורש אך יהיו תמשיים. וכן על זה הדרך והכלל
רביעיים ואם בין השורש תמשיים תתיך החשבון לעשיניים ותה שיצא
שאם בין השורש רביעיים תתיך החשבון לשמיניים, ותה שיצא גיה
השברים אשי יחיה רחוק תמיך השוכש כמו מרחק בין השורש תתעלות. רצ
בשורש, תקראהו בין השורש, ואחר זה תתיך כל בחשבון אשר בידך אל תין
רביעיים או תמשיים או ששיים, או אינה תין שברים אשר תרצה לדקדק שיצא
כפי תג שיהיה, דע לך עד כמה שברים תרצה לדקדק שיצא השורש, כי אם
ץ6 וכן אם ברצה לתצוא שרש אינו משבון שיגיה בידך תתעלות וראשונים ושביים
הדרך. וחי לך בנה.

כמו מרחק התמשיים תגדר התעלות, ויצא לך בחלוקה תמשיים. וכן על זה
חשבון השור העליון לשמיניים, שהוא רחוק תשברי השור התחתון חמשה תדרגות,
ויצא לך בחלוקה רביעים. ואם תרצה לדקדק עד שיצא בחלוקה תמשיים תגדר התעלות,
שהוא רחוק תשברי השור[התחתון] מרחק הרביעיים תגדר התעלות, ואז יצא
ותרצה לדקדק עד שיצא לך בחלוקה רביעים, תשבר חשבון השור העליון לשביעים.
בחלוקה רביעים. וכן על זה הדרך וכן אם שברת השור התחתון לשלשיים
רחוק תמשנים אובע תדרגות, כמו מרחק הרביעיים תגדר התעלות, ואז יצא לך
לדקדק עד שיצא בחלוקה רביעיים, תשבר חשבון השור העליון לשלשיים, שהוא
כמו מרחק השלשיים תגדר התעלות, ואז יצא בחלוקה שלשיים. ואם תרצה
חשבון השור העליון לתין תמשיים, שהוא רחוק תין השניים שלשה תדרגות,
שלשיים או אילה תין שתרצה, ונשים הדמיון שתרצה שלשיים, כגה תשבר
דמיון: אם שברת חשבון השור התחתון לתין השניים, ותרצה שיצא לך בחלוקה
בו התחתון כמו שיהיה תרחק תגין שתרצה שיצא לך בחלוקה תין התעלות.
השור התחתון, ושבר אותו אל תין השברים שיהיה רחוק תגין השברים ששברת
על זה בדרך. ואמר כן כל חשבון השור העליון, והוא החשבון אשר יחולק על חשבון
אשר בו הוא שניים, תעשה מחלק שניים, ואם שלשיים תעשה מחלק שלשיים, וכן
השור העליון, ותשבר הכל אל תין השבר העתר קטן אשר בו. כי אם השבר היותר קטן

Translation

A Method of Division by Rabbi Immanuel, and Other Topics

Introduction (52)

1. *Terminology and Definitions*

Know that the unit is divided into ten parts which are called Primes, and each Prime is divided into ten parts which are called Seconds, and so on into infinity. I also want to call to your attention that I am calling the degrees of the tens Prime Integers, and the hundreds Second Integers, and so on into infinity. The degree of the units, however, I am calling by their name Units, for it is an intermediate between the integers and the fractions. Therefore, if one multiplies units with units the result is units. Furthermore, I am calling the degrees with a higher denominator (53) " Of a higher denominator." I mean by that : I am calling the Thirds, of a higher denominator than the Seconds, for the Thirds are derived from three, while the Seconds come from two. Similarly, the Fourths are of a higher denominator than the Thirds, and the Fifths than the Fourths. And this applies to the integers as well as to the fractions.

Furthermore, when I say : add this denominator to that denominator, or subtract this denominator from that denominator, I mean by that : add the denominator of the Seconds to the denominator of the Thirds, so that the result will be Fifths, or, the denominator of the Seconds to the denominator of the Seconds, so that there will result Fourths. Or also, subtract the denominator of the Seconds from the denominator of the Thirds and there will remain Primes, or, the denominator of the Seconds from the denominator of the Seconds and nothing will remain, hence it (54) will fall into the degree of the units. And this

(52) This heading is found in the Hebrew MS., and may have been applied by Bonfils to the first paragraph containing the terminology and definitions, while paragraphs 2 and 3 were regarded as the text proper. It is possible, however, that all the three paragraphs were intended to form the introduction to a larger text, which became lost or was never written.

(53) Literally *shem*, " name."

(54) The Quotient.

applies to the integers as well as to the fractions. And if you subtract a large denominator from a small denominator, as when we say : let us subtract Fourths from Seconds, [be it among integers] (55) or among fractions, then it (56) will come into the degree of the Seconds of the opposite direction. For instance, when we say : let us subtract the denominator of the Fourths, among the fractions, from the denominator of the Seconds, also among the fractions, then it falls into the degree of the Second integers. Similarly, if we say the same with regard to the integers, i.e. : if we want to subtract the denominator of the Fourth integers from the denominator of the Second integers, then it falls into the Second fractions (57).

2. *Multiplication*

If you multiply one number with another number, both being integers or both fractions, add the denominator of the degrees of the one [to the other one], and there the product will be : among the integers, if both are integers, and among the fractions, if both are fractions. If, however, [the one] is an integer and the other one a fraction : if they have the same denominator, then the product will fall into the degree of the units. But if the one has a higher denominator than the other one, then subtract the smaller from the higher one, and where the number of the remaining denominator is, there the product falls; among the integers, if the denominator of the integers is higher, or among the fractions, if the denominator of the fractions is higher.

3. *Division*

If you divide one number by another number, both being integers or both fractions, and the denominator of their degree is the same, then the quotient will fall into the degree of the units. For if you subtract the one denominator from the other deno-

(55) Added by conjecture.

(56) The Quotient.

(57) BONFILS omits to say how one shall proceed when the denominator of the fraction is to be deducted from the denominator of the integers, or, when an integer is divided by a fraction. But the rule is given below, at the end of § 3, where it is expressed by a somewhat different formula.

minator, nothing remains; hence it falls into the degree of the units. If [the denominator of] the upper (58) is higher than the denominator of the lower one, subtract the denominator of the lower from the denominator of the upper one, and where the number of the remaining denominator is, there the quotient will fall, in the same direction, i.e. among the integers, if it is an integer, or among the fractions, if it is a fraction. If, however, the lower is higher, then subtract the denominator of the upper from the denominator of the lower one, and where the number of the remaining denominator is, there the quotient will fall, in the opposite direction, i.e. among the fractions, if both are integers, or among the integers, of both are fractions. If, however, the one is an integer and the second is a fraction, may their degrees have the same denominator or different denominators, then add the denominators of the degrees, and the quotient will fall where the number of the resulting denominator is : among the fractions, if the upper is a fraction, or among the integers, if the upper is an integer.

4. *Degrees with Odd Denominators Contain Squares*

Know that the degree of the units contains three square numbers, i.e. [such numbers] whose roots are integers and known. These are : one whose root is one; four whose root is two; and nine whose root is three. In the second degree, however, which is the degree of the tens (59), there is no square number at all, unless some units are added to them. Thus ten is no square number, nor is twenty, nor is 30, 40, 50, 60, 70, 80, and 90. With the additions of units, however, there are in them six squares. I mean by that, if we add some units to the tens. For instance, 16 has the root 4, 25 has the root 5, 36 has the root 6, 49 has the root 7, 64 has the root 8, and 81 has the root 9. Each degree of the number, however, which is indicated by an odd number, as the third, fifth, seventh, ninth and so on into infinity, resembles the degree of the units and contains three squares like the degree of the units. For example, there are three squares in the degree of the hundreds, similar to the first degree, and these are : 100

(58) The upper number, or row, is the dividend ; the lower is the divisor.
(59) See I, § 5.

which resembles the square *one*, and its root is ten like the *one*. Likewise, 400 is similar to the square 4, and its root is also similar to the root of 4 which is 2, for its root is 20. The same you will find among the other degrees, if they are odd numbered (60).

5. *Sexagesimal Magnification of Numbers for Division*

If you want to divide a number of degrees, minutes (61) and seconds by another smaller or higher number, then take the number of the lower row, which is the number by which the number of the upper row is divided, and break it all into the kind (62) of the smallest fraction in it (63). For example, if its smallest fraction is Seconds then reduce the whole into Seconds, and if Thirds then reduce the whole into Thirds, and so on in the same manner. Thereupon take the number of the upper row, which is the number divided by the number of the lower row, and break it into such a kind of fractions, that its distance from the kind of fractions into which you have broken the lower be equal to the distance of the kind of fractions which you want to obtain in the quotient from the degrees. For example: if you have broken the number of the lower row into the kind of the Seconds and you want to obtain in the quotient Thirds, (or any other

(60) This rule is based on the general rules of EUCLID, *Elements*, IX, 8, 10, and NICOMACHUS OF GERASA, II, 20, 5; 24, 10; pp. 263, 270 of the ed. D'OOGE, etc. According to EUCLID, IX, 8: "If as many numbers as we please beginning from an unit be in continued proportion, the third from the unit will be square, as will also those which successively leave out one," i.e. all the odd numbered members of the series. Since 4 and 9 are squares, and m^2n^2 is also a square (see NICOMACHUS, II, 24, 10; p .270; EUCLID, IX, 1; JOANNIS HISPALENSIS, *Liber Algorismi*, p. 73; LEVI B. GERSHON, *Ma'aseh ḥosheb*, p. 81), the rule is extended to all the odd numbered decimal degrees beginning with 4 and 9. The rule for the occurrence of the squares is also given by AL-KARKHĪ, *Kāfī*, II, p. 12, chap. 39; IBN EZRA, *Sefer ha-Mispar*, p. 62; JOANNES HISPALENSIS, *loc. cit.*, p. 73-74; the Algorismus of the 12th century ed. CURTZE (see above. p. 27, note 34), p. 14 and 25 f.; LEVI B. GERSHON, *loc. cit.*, p. 80-81; MIZRĀḤĪ, *Sefer ha-Mispar*, f. 63*b*-64*a*, 60*b*-61*a*. Some of these authors add that in the sexagesimal fractions the even numbered degrees are squares; see AL-KARKHĪ, the Algorismus of the 12th century and LEVI B. GERSHON.

(61) BONFILS deals here with the sexagesimal fractions; see above I, § 5.

(62) Throughout the paragraphs 5 and 6 BONFILS uses the term *min*, "kind, species," instead of *shem*, "denominator," used above.

(63) Cf. *Algoritmi de numero Indorum*, p. 20.

kind that you want, but let us suppose in this example that you want Thirds), then break the number of the upper row into the kind of Fifths, which is removed from the Seconds three degrees, like the distance of the Thirds from the limit of the degrees, and then you will obtain in the quotient Thirds. And if you want to be more accurate and obtain Fourths in the quotient, break the number of the upper row into Sixths, which is removed from the Seconds four degrees, like the distance of the Fourths from the limit of the degrees, and then you will obtain Fourths in the quotient. And so on in the same manner. Similarly, if you broke the lower row into Thirds and you want to be accurate up to obtaining the Fourths in the quotient, then break the number of the upper row into Sevenths, which is removed from the fractions of the lower row four degrees, like the distance of the Fourths from the limit of the degrees, and then you will obtain Fourths in the quotient. And if you want to be accurate up to obtaining Fifths in the quotient, then break the number of the upper row into Eighths, which is removed from the fractions of the lower row five degrees, like the distance of the Fifths from the limit of the degrees, and you will obtain Fifths in the quotient. And so on in the same manner. And that may be enough for you (64).

6. *Sexagesimal Magnification of Numbers for Root Extraction*

Similarly, if you want to extract the root of any number that you have, consisting of degrees, Primes and Seconds, [or otherwise] just as it happens, make sure up to how many fractions you want to be accurate in the root. I mean to say, if you want to be accurate in the root up to the Fourths, Fifths, or Sixths, or any other kind of fractions, then call it " the Kind of the Root." Thereupon melt the whole number that you have into such a kind of fractions that its distance from the Kind of the Root will be like the distance of the Kind of the Root from the degrees. That is : if the Kind of the Root is Fourths, melt the number into Eighths and you will obtain Fourths in the root. And if the Kind of the Root is Fifths, melt the number into Tenths and you will obtain Fifths

(64) On the calculation with sexagesimal fractions see above I, § 3, and cf. also TROPFKE, *loc. cit.*, I², pp. 35 ff., 40, 73 and 90 f.

in the root. And so on according to the same manner and rule (65).

TERMINOLOGY

'Elyon, the upper (number, or row), the dividend.
Gera', deduct.
Ḥabber, add.
Ḥaluqqah, the quotient.
Hattekh, melt, reduce a number into the lowest kind of fraction.
Ma'alah, degree; meaning the decimal powers, and also the integers in the sexagesimal fractions.
Madregah, degree, of the decimal powers and of the sexagesimal fractions.
Min ha-sheber, the kind of the fraction.
Nifrad, odd.
Rishonim, *Sheniyyim*, Primes, Seconds, of the decimal powers and of the sexagesimal fractions.
Shabber, break, reduce a number into the lowest kind of fractions.
Shebarim, fractions.
Shelemim, integers.
Shem, name, denominator. *Gedol ha-shem*, of a higher denominator.
Shoresh, root.
Taḥton, the lower (number, or row), the divisor.
Ṭur, row. The upper row is the dividend, and the lower row is the divisor.

New York City SOLOMON GANDZ.
October 16, 1935.

(65) The method of decimal magnification given by JOHN of MEURS in his *Quadripartitum numerorum* (composed c. 1343) II, which reads :

$$\sqrt{2} = 1/1000\ \sqrt{2.000.000} = 1/1000.\ 1414 = 1^{0}\ 24'50''24'''$$

and which is reported in his name by KARPINSKI, *Science*, 45, (1917), p. 663-5, and after him by SARTON in *Isis* 23 (1935), p. 169, is found already in JOANNES HISPALENSIS, *Liber Algorismi*, p. 87-90, and in the Algorismus of the 12th century ed. CURTZE, in the *Abhandlungen zur Geschichte der Mathematik*, 8, (1898), pp. 14 and 25-27. Since both these treatises are elaborations of AL-KHUWĀRIZMĪ's arithmetic, it is safe to say that the method goes back to AL-KHUWĀRIZMĪ; see above notes 30 and 34. A certain kind of sexagesimal magnification for root extraction was develop edalready by THEON OF ALEXANDRIA (c. 390 A.D.); see CANTOR, *Geschichte der Mathematik*, I³, p. 494. AL-KARKHĪ, *Kāfī*, II, p. 15, gives BONFILS' rule in a much simpler formulation. In fact the content of all the three paragraphs, 4-6, occurs in the *Kāfī*, II, pp. 12, 11, 15; chaps. 39, 36-7, 41. And yet the writer does not think that BONFILS took them from AL-KARKHĪ, since the latter gives the rules in a much more precise form than BONFILS.

POSTSCRIPT

After I finished this paper I noticed in ZOTENBERG's *Catalog* that the MSS. Hebrew 1081 and 1026 of the National Library of Paris contain some arithmetical rules by BONFILS. Upon my request DR. SARTON was kind enough to order the photostats for me. These, however, did not reach me till the beginning of December, after I had returned the first proofs. I, therefore, restrict myself to report, briefly, that the Hebrew text reproduced here is also contained in MS. Hebrew 1081, but in two separate sections, thus confirming my theory expressed in I, § 5. The paragraphs 1-3 are on f° 13 *r.*, line 5, till f° 14 *v.* Paragraphs 4-6 of our text are the incomplete, disconnected fragments of a chapter on the extraction of roots, which is fully preserved in MS. Hebrew 1081. It extends there from f° 5 *v.*, line 3, till f° 13 *r.*, line 4. (Folio 10 is blank). § 4 is found on f° 5 *v.*, line 13—f° 6 *r.*, line 9. §§ 5-6 are on f° 11 *r.*, line 9—f° 12 *r.*, line 11. In MS. 1081, § 6 ends as follows : " And so on according to the same manner. And the rule is that you should double the ' Kind of the Root,' i.e. its denominator. If it is Seconds melt it into Fourths, if it is Thirds melt it into Sixths, if it Fourths melt it into Eighths, and if it is Fifths melt it into Tenths." Almost all the emendations suggested in this paper are borne out by the new MS.

I desire to thank Professor DAVID EUGENE SMITH for reading the proofs and making a few suggestions.

December 4, 1935. SOLOMON GANDZ.

Mathematics in the Netherlands during the first half of the XVIth century (*)

1. The consolidation of the Burgundian-Habsburg state in the Netherlands, stimulated by the commercial development of the cities and the growth of their importance on the ruins of an antiquated feudal system, had considerable influence on the development of mathematics. In this period mathematics appeared mainly as an applied science useful for the many and growing needs of the new economic and political system. Pure science of mathematics, as the scholastic age to a certain degree had known and as we know again since the seventeenth century, played only an accidental role in this early period of modern exact science.

The center of scientific and educational activity was still the South, the Northern Netherlands growing in importance but only taking supremacy during the Eighty Years War. Antwerp was by far the most important commercial city; Brussels was the capital and Louvain the seat of the university and of orthodox learning. Throughout the country was spread a system of Latin schools, organized partly by city administrations, and partly by monastic or semi-monastic groups such as the Brethren of the Common Life in the Northern Netherlands. Private schools in the homes of " rekenmeesters " (reckoning teachers) supplied, in an increasing degree, the useful arts of commerce, such as accounting, computation, and the principles of nautics.

The main impulse for the study of mathematics came more and more from the direct and indirect requirements of commerce and the related needs of the growing cities. It came from seafaring, bookkeeping, cartography, and astronomy. Cartography was stimulated not only by the sailor, but also by the centralizing

(*) This paper, written for the D. E. SMITH Presentation Volume (*Osiris* I), had reached us too late to be included.

state and the city and by the needs of warfare and of administration. Astronomy was cultivated not only among geographers and the seafaring part of the population but also among large numbers of people interested in astrology—a growing need felt in those revolutionary days full of uncertainty. Additional causes were the geometrical interests of the painters and other artists, the steadily growing requirements of architecture and engineering, such as drainage, dyke and windmill-building, city hygiene and manufacture. All these different factors led the study of mathematics into rapidly expanding channels, a fact which compelled the Latin schools and the university to reconsider their curriculum and to devote an increasing amount of time to mathematics and related sciences.

2. The most influential and productive mathematician of this period in the Netherlands, RAINER GEMMA FRISIUS (1508-1555), reflected all these tendencies in his career and his activity. He was born in Dokkum in Friesland, but since his student days lived in Louvain, where in 1528 he became a master of arts, in 1542 a doctor of medicine, and built up a reputation as a teacher of geography, mathematics, astronomy, and later of medicine. He tried to satisfy the new requirements of the age on exact science inside the sacred walls of the old bulwark of theology and scholastic learning (1). He belongs to the founders of modern cartography and geodesy, in which fields he added new ideas and methods to those of the Ancients. With GASPAR VAN DER HEYDEN he constructed a globe of the earth (1531); he gave prescriptions for triangulation in an appendix (on " the art of description of places ") to his edition of APIANUS' " Cosmography " (1533); he used the stereographic projection in his world map of 1540; he showed how to determine geographical longitudes with the aid of a watch (1530, " De usu globi ") and is credited with the improvement of astronomical instruments. CHARLES V recognized his importance and tried without success to connect him with the Brussels court. Although

(1) See VAN ORTROY, 1911, POGO, 1935. GEMMA's name seems to have originally been VAN DER STEEN, see Biographie nationale de Belgique. On the pioneering character of GEMMA's teaching see S. GUNTHER, 1887, p. 227.

GEMMA FRISIUS died at the early age of 47, his influence continued through his books and pupils.

Indeed, though GEMMA's work was of a pioneering character, it was at the same time carried on and supported by a growing number of artisans, technicians, and scientists. In many cities of the Low Countries surveying work was done, not only in the South but also in the North. The names of several of these surveyors are known, such as JACOB VAN DEVENTER (1500-1575) (2) and CORNELIS ANTHONISZ VAN AMSTERDAM (1499—after 1553). By the beauty of their work they form a connecting link between the science and the arts of the period. GEMMA and his school however went out beyond the traditional work of these men. New heights were reached in the work of MERCATOR (1512-1594), whose world map of 1569 opens not only a new period in cartography, but also makes a new and important contribution to geometry by means of its so-called MERCATOR projection (3). GEMMA also influenced the geographical work of ORTELIUS (1527-1598) of Antwerp. The work of MERCATOR and ORTELIUS was continued in the Dutch cartographic school of the 17th century (HONDIUS, BLAEU) and in the geodetic activity of SNELLIUS.

By means of his textbook on arithmetic of 1540 GEMMA had a lasting influence in the field of arithmetical education. This "Arithmetica," written in Latin, was for a long time one of the outstanding textbooks for Latin schools. It contained in Latin all the elements of addition, subtraction, multiplication and division needed by the new commercial generation and often despised in the Latin schools. The appearance of this little textbook was an important educational event for the Latin schools of those days, where almost no mathematics was taught except perhaps some old number theory of BOETHIUS, as prescribed in the quadrivium, or some geometry necessary for cosmography. The textbook's success is shown by the number of editions; D. E. SMITH has counted 59 printed before 1598 (4). Even as late as the end of the 17th century it was in use, as is testified by CHRISTIAN WOLF (1679-1754), who mentioned it with

(2) J. VAN DEVENTER, 1916.
(3) H. AVERDUNK, 1914.
(4) D. E. SMITH, 1918, p. 200.

gratitude (5). This popularity is a sign of the great turn made in the teaching of arithmetic in the Latin schools and the universities of those days. Translations made it accessible to a still larger number of students.

The book has a certain scientific originality too. STIFEL, GEMMA's contemporary, praised its solution of the (pure) quadratic equation by means of a double application of the regula falsi (6). But its educational value is of greater importance than its scientific value.

Another arithmetical textbook for Latin schools, though less complete but nevertheless illustrating similar tendencies as GEMMA's " Arithmetica," is the " De Numeris " (1539), by JOHANNES VAN BRONCKHORST (1494-1570), (JOHANNES NOVIOMAGUS), professor at Cologne (1539), and Rostock (1542), from 1546-1563 rector of the Latin school (" kapittelschool ") in Deventer (7). This book however has retained more characteristics of an older age, due to the humanistic inclinations of the author. An edition of 1551 was printed in Deventer by D. DE BORNE. The small " Arithmetica " (1531) of JOACHIM RINGELBERG (1499-1536), a curious ambulant teacher, artist, medicine man, and practical philosopher (8), was also framed after the old pattern of the quadrivium, and was certainly not especially written for practical purposes.

3. The gap between the Latinized university doctors and the " uncouth " teachers of arithmetic, technicians, and bookkeepers of the commercial cities existed, to the disadvantage of both, throughout the 16th century and later.

The universities and Latin schools of this period were not the carriers of the life in exact science. Prince MAURICE of Orange, around 1600, could only indirectly connect the greatest mathematicians of his country, STEVIN and VAN CEULEN, both ignorant of Latin, with the university of Leiden. At Louvain,

(5) F. GUNDEL, 1928, p. 75, cit. from WOLF's " Kurzer Unterricht von den vornehmsten mathematischen Schriften," P. 9 and foll.

(6) M. STIFEL. Arithmetica integra 1544, see CANTOR, 1892, p. 378; see also S. JACOB, Rechenbuch, 1565, p. 272*a*, also p. 254*a*; on the originality of the method see G. ENESTRÖM, *Bibl. math.* (3) 7 (1906-07), p. 89.

(7) v. SCHEVICHAVEN, 1911.

(8) J. OVERMAN, 1903.

GEMMA was succeeded by JEAN STADE, an unimportant man, and STADE by ADRIAEN VAN ROOMEN, who, though sufficiently important, did not reside long in Louvain. This situation was reflected even in such details as the use of the word " million " for 10^6. This word appeared at an early age in those books on arithmetic in the popular language which were influenced by the French; while the Latinized doctors refused to use it. GEMMA substituted for it the word "millena milia," NOVIOMAGUS " mille millia." His humanistic colleague, the English bishop TANSTAL, revealed the reason for this reluctance. The word million, he wrote, is a barbarous slang expression (9). " Million " penetrated into the written language through commercial channels, since its first use in Italy in the 13th century (10).

The influence exercized by the popular teachers of arithmetic can hardly be underestimated. The existence of arithmetical books in the Flemish language has now been traced up to as early a date as 1508, when T. VAND'NOOT, in Brussels, published a " Maniere om te leeren cyfren." Possibly earlier books exist. The booklet seems to have passed through several editions; an enlarged edition is known from about 1510, published by W. VORSTERMAN in Antwerp, another from 1527, by JAN SEVERSZ in Antwerp. In 1537 another book, " In Arithmetica," by GILLIS VAN DEN HOECKE, appeared in Antwerp, published by S. COCK. Several editions of this book are known. That arithmetic was taught in the local idiom at a much earlier date is obvious, but it is also proved by an algorithm in the dialect of Cleve-Emmerich, dating from the fifth decade of the 15th century and published by S. GUNTHER from the manuscript. Another Flemish book written in this period is that composed by JAN YMPYN, published by his widow in 1543 and again in Antwerp; it also appeared in a French and later in an English edition. The books by VALENTIN MENHER (1550 and later), also reprinted, appeared in French only. These books all deal with the same material as GEMMA's book, to the four species often adding the old " counting on the lines," a form of abacus with

(9) C. TONSTALL, De Arte supputandi libri quatuor, London, R. PYNIAN, 1522, fol. B 4*a* : " millena milia : vulgus millionem barbare vocat. Latine reddideris, ut nunc fit supputatio, vel millena millio, vel millies millena."

(10) D. J. STRUIK, see also SCHULTE, 1935, p. 50.

counters (" rekenpenningen "), a practice quite common in the 16th century. YMPYN and MENHER completed their text with an explanation of the Italian art of bookkeeping.

4. In this account we miss some trace of a practical treatise on arithmetic published in the Northern Netherlands, in spite of the fact that Amsterdam already was an important commercial city, and the old Hanseatic cities like Kampen and Deventer, though losing their former glory, still had a rich and active merchant population. The schools of many cities of the North were famous and frequented by thousands of students. Among their teachers were humanists whose names have not been forgotten. We must conclude that interest in " modern " mathematics was small, and that, at most, some long forgotten private teachers in Amsterdam and other cities taught the secrets of the four species either orally or from Flemish and German books. From a financial account about 1536 of one of the Latin schools in Leiden we might conclude that the only arithmetic taught was counter-reckoning (11). Some of the humanistic teachers at the fraternal schools are known as mathematicians or cosmographers, but we get the impression that their knowledge hardly surpassed the traditional quadrivium (12). Such an instructor was BARTHOLOMEUS VAN KEULEN (1460-1516), in his days a famous teacher and purifier of Latin, who used to discipline his pupils in Deventer with a club " like a second Hercules," and wrote a little book on the computus and cosmography (1499) (13), which did not go beyond the traditional material. The oldest known arithmetical textbook published in the North is the " Arithmetica " by MARTINUS CRESZFELT. The fact that

(11) P. J. BLOK, 1912, p. 186, cit. from RAMMELMAN ELZEVIER, *Mededeelingen Maatsch. Nederl. Letterk.*, 1877-78.

(12) G. H. M. DELPRAT, 1856, gives the names of JORIS VAN LANGHVELDT (MACROPEDIUS), 1475-1558, who made mathematical and counting instruments (p. 156), and KORNELIS WOUTERS (VALERIUS), 1512-1578, who wrote a " Physicae institutio," Antwerp, PLANTIN, 1567, and taught at Louvain and Alkmaar (p. 159). J. G. R. ACQUOY, 1875, II, p. 216, mentions in this period PETER JACOBSZ (first part 16th century) from the monastery Thabor near Sneek (Friesland) as an able surveyor and astronomer.

(13) Bartholomei Coloniensis Canones una cum declarationibus eorundem in tabulas Computi ecclesiastici, etc. (Royal Library, The Hague).

this book was published in Deventer (1557) (14), may also indicate the importance of this town as a small mathematical center of the country, the more so as the schoolmaster, teacher of mathematics, and one of the first authors of mathematical books in Dutch in Amsterdam (since 1567), NICOLAS PIETERSZ (PETRI), originally also came from Deventer (15).

5. The study of geometry in the Netherlands in this period does not seem to have stimulated authors to produce textbooks on geometry. Probably the reason was that the Latinists contented themselves with EUCLID, either directly or indirectly through BOETHIUS or another abstract of EUCLID; while the men of commercial practice either neglected geometry or taught as much as the elements of cosmography required. RINGELBERG, in giving advice on textbooks, recommended EUCLID for geometry (16). MERCATOR, in the city school of Duisburg, taught geometry and arithmetic as applied to cosmography. He recommended some abstract of EUCLID or VÖGELIN's "Elementare" for geometry and GEMMA FRISIUS for arithmetic (1561). (17) The relation of geometry to cosmography is shown again in the appearance, in 1563, of MENHER's book on spherical triangles. Algebra first appeared in MENHER (1564), followed by a Portuguese book by NUÑEZ (1567), again both published in Antwerp. The increasing production of arithmetical books compared with the relative stagnation in geometry shows again how forceful the pressure from the commercial side in this period was on the development of mathematics. (18)

Cambridge, Mass. Haarlem. D. J. STRUIK.

(14) CRESZFELT came to the Netherlands in 1555 and became "rekenmeester" at Deventer. He wrote his book at the request of the city authorities of that place, because he had been unable to find any arithmetical book based upon the monetary system, the measures and weights of the country. Creszfelt was still used in 1607, see D. A. VALCOOGH, 1875.

(15) H. BOSMANS, 1908. 2. C. P. BORGER, 1908, 1.

(16) J. OVERMANN, 1903.

(17) In H. C. GELDORP, 1501, see H. AVERDUNK, 1914, p. 45.

(18) The author is indebted to Dr. J. A. VOLLGRAFF, Leiden, for much information on books in the University Library at Leiden.

BIBLIOGRAPHY OF MATHEMATICAL PUBLICATIONS RELATING TO MATHEMATICS IN THE NETHERLANDS WHICH APPEARED BEFORE 1570

1508. Die maniere om te leeren cijffren na die rechte consten Algorismi. Brussels, T. VAND' NOOT.

Royal Library Brussels, British Museum, London, (19) see W. NIJHOF-M. E. KRONENBERG 1923, no. 1482.

1510? Die maniere om te leeren cijfferen ende rekenen metter pennen en metter penningen. Antwerp, W. VORSTERMAN.

Library University Amsterdam, see C. P. BURGER 1929, p. 196-201. Probably an enlarged edition of the book of 1508. A probable reprint of this 1510? edition in the library of Mr. W. H. JERVIS WEGG, London; 1527, Antwerp, J. SEVERSZ.

1529. P. APIANUS. Cosmographicus liber correctus per GEMMAM PHRYSIUM. Antwerp, J. GRAPHEUS.

Royal Library, Brussels, see W. NIJHOF-M. E. KRONENBERG, 1923, no. 121, who mention reprints of 1533 and later, and a Flemish edition, 1537, Antwerp, G. DE BONTE, in J. C. BROWN Library, Providence, R.I. The book was often reprinted under the title of " Cosmographia."

1531. J. FORTIUS RINGELBERGIUS. Arithmetica. Lyons, S. GRYPIUS.

In his " Opera," Plimpton Library New York, see D. E. SMITH, 1910, p. 165; also A. DE MORGAN, 1847, no. 16. Several editions are known. The " Arithmetica " takes p. 401-416 of the Lucubrationes of RINGELBERG, Basel 1541, in Library University Leiden.

1533. G. FRISIUS. Libellus de locorum describendorum ratione. Antwerp, printer J. GRAPHEUS.

Royal Library The Hague, W. NIJHOF-M. E. KRONENBERG, 1923, no. 122; POGO, 1935, p. 472. This book, as well as the later editions, bound together with APIANUS 1529. Also a Flemish edition of 1537, with later editions. Facsimile reprint with commentary by A. POGO, 1935.

About 1535. G. COMPARST. Un livret du compte. Antwerp, S. COCK.

British Museum London, see M. NIJHOF-M. E. KRONENBERG, 1923, no. 1019. This is, as Mr. H. L. TOWNSHEND, London, kindly writes me, a book of 144 unnumbered leaves, dealing with arithmetic and not with bookkeeping.

1537. G. VAN DEN HOECKE. In Arithmetica, een sonderlinge excellent boeck. Antwerp, S. COCK.

Plimpton Library New York. A probable reprint in Econ. Hist. bibliotheek Amsterdam and Royal Library Brussels, 1545, Antwerp, S. COCK, see D. E. SMITH, 1908, p. 183, H. BOSMANS, 1905, p. 267; also a reprint of 1548, see H. BOSMANS, *l.c.* G. ENESTRÖM, 1906,

(19) As a rule only one or two libraries are mentioned.

denies the existence of an edition of 1514, which is in reality the edition of 1545. I am indebted to Dr. J. C. WESTERMANN, Amsterdam, for additional confirmation of this fact.

1539. J. NOVIOMAGUS. De Numeris libri duo. Paris, CHR. WECHELUS.
Plimpton Library New York, see D. E. SMITH, 1918, p. 195; A. DE MORGAN, 1847, no. 18; another edition of 1539, Cologne, J. RUREMUNDANUS, see v. SCHEVICHAVEN, 1911. There were editions of 1544 and later. D. E. SMITH describes one of 1551, Deventer, T. BORNIUS.

1540. G. FRISIUS. Arithmeticae practicae methodus facilis, Antwerp, A. C. DIESTHENS.
Library University Leiden. Regularly reprinted for a century or longer.

G. FRISIUS. Charta sive mappa mundi. Louvain.
See H. AVERDUNK, 1914, p. 7.

1543. J. YMPYN. Nieuwe Instructie ende bewijs der loofelijcker Consten des Rekenboecks. Antwerp, G. C. VAN DIEST.
Public Library Antwerp. A French edition of the same year and printer, an English edition of 1547, see H. BOSMANS, 1908, R. DE ROOVER, 1935.

1548. CL. PTOLEMAEUS... Operis quadripartiti, in latinum sermonem traductio. Publ. by A. GOGAVA, preface of GEMMA FRISIUS, Louvain, P. PHALESIUS and M. ROTARIUS.
Mun. Library Louvain, State Library, Berlin, see J. L. HEIBERG-E. WIEDEMANN, 1910.

1550. V. MENHER. Practique briefve pour cyfrer et tenir livres de comptes. Antwerp, J. LOE.
Royal Library Brussels, see H. BOSMANS, 1908, D. E. SMITH, 1908, p. 249, the part dealing with bookkeeping of an edition of 1556, same printer, in Library University Leiden, republished by J. G. CH. VOLMER, 1894, Utrecht, J. VAN DRUTEN.

1556. V. MENHER. Arithmétique seconde. Antwerp, J. LOE.
Plimpton Library New York; according to D. E. SMITH, 1918, p. 250, 281, 283, substantially a reprint of MENHER, 1550.

1557. M. C. CRESZFELT. Arithmetica. Reeckeninge op den Linien ende Cijfferen. Deventer, DERICK VAN DEM BORNE, 1557.
In Library University Leiden is an edition of 1577, REES, D. W. VAN SANTEN.

1561. H. C. GELDORP. De optimis genere interpretandae philosophiae,
State Library, Munich, see H. AVERDUNK, 1914, p. 45.

1563. V. MENHER. Practique des triangles sphericques. Antwerp. G. C. V. DIEST, 1563-1564.
Royal Library Brussels, see H. BOSMANS, 1908, p. 272; D. E. SMITH, 1918, p. 249.

1564. V. MENHER. La Regle d'Algebra. Antwerp, A. DIEST.
Plimpton Library New York, see D. E. SMITH, 1918, p. 249.

1567. N. PETRI. Arithmetica. Practique omme costelycken te leren chypheren. Amsterdam, WED. J. EUWOUTSZ.

Library University Amsterdam, see C. P. BURGER, 1908, p. 1-36, H. BOSMANS, 1908.

P. NUÑEZ. Libro de algebra en arithmetica y geometria. Antwerp, Wed. J. STELSIUS.

Library University Louvain, see H. BOSMANS, 1908, who also mentions an edition of 1567, Antwerp, A. BRINCKMANN. See also A. DE MORGAN, 1847, p. 23, citing HUTTON's Tracts II, p. 250.

1569. A. VAN DER GUCHT. Cijferbouck. Bruges.

Cit. by D. E. SMITH, 1908, p. 338.

G. MERCATOR. Nova et aucta orbis terrae descriptio ad usum navigantium emendate accomodata.

See H. AVERDUNK, 1914, p. 65, 128.

H. J. HELMDUYN. Rekenboeck tracteerende van alderhande coopmans handeling. Amsterdam, C. CLAESZ.

In Library University Amsterdam a copy without date of publication, mentions 1569 as date of first publication.

FURTHER LITERATURE

1847. A. DE MORGAN. Arithmetical books, from the invention of printing to the present time, London, TAYLOR, 24 + 128 p.

1856. H. G. M. DELPRAT. Verhandeling over de broederschap van GEERT GROOTE, 2d ed., Arnhem, NIJHOF, 371 p.

1875. J. G. R. ACQUOY. Het klooster te Windesheim, 3 vol., 1875-1880, Utrecht, v. d. POST.

D. A. VALCOOGH. Regel der Duytsche Schoolmeesters, ed. G. D. J. SCHOTEL, Den Haag, J. YKEMA, 123 p. (Reprint of a book of 1607).

1877. P. TREUTLEIN. Das Rechnen im 16. Jahrhundert. *Abhandl. z. Gesch. d. Mathem.* 1, p. 1-100.

1887. S. GUNTHER. Geschichte des mathematischen Unterrichts im deutschen Mittelalter bis zum Jahre 1525. Berlin, A. HOFMANN. Monumenta Germaniae Paedagogica III.

1892. M. CANTOR. Vorlesungen über Geschichte der Mathematik, II, Leipzig, TEUBNER, 863 p.

1903. J. OVERMANN. JOACHIM RINGELBERG, Diss. Erlangen, 1902, 46 p.

1905. H. BOSMANS. Le fragment du commentaire d'ADRIEN ROMAIN. *Annales Soc. Sc. Bruxelles* 30 (1905-06), p. 267-287.

1906. L. L. JACKSON. The educational significance of sixteenth century arithmetic. Teachers College, Columbia University, New York, 232 p.

G. ENESTRÖM. *Bibliotheca mathematica* (36) (1906-07), p. 211.

1908. C. P. BURGER. Amsterdamsche rekenmeesters en zeevaartkundigen in de zestiende eeuw (De Amsterdamsche Boekdrukkers en Uitgevers II.) Amsterdam, C. L. v. LANGENHUYSEN, 225 p.

H. BOSMANS. La "Practique om te leeren cypheren," *Annales Soc. Sc. Bruxelles*, 32, II (1907-08), p. 272-301.

H. BOSMANS. L'Algèbre de PEDRO NUNEZ, *Ann. Acad. Polyt.* Porto, 3, 50 p.

D. E. SMITH. Rara arithmetica. GINN & Co., Boston, London, 507 p., in 2 vols.

1910. J. L. HEIBERG-E. WIEDEMANN. Eine arabische Schrift über die Parabel und parabolische Hohlspiegel. *Bibliotheca mathematica* (3) 11 (1910-'11), p. 193-208.

1911. VAN SCHEVICHAVEN. JOHANNES VAN BRONCKHORST, art. Nederl. Biograf. Woordenboek I.

F. VAN ORTROY. Bio-bibliographie de GEMMA FRISIUS. *Mémoires Acad. Belgique, Classe des lettres*, coll. in 8°, (2) 11, 418 p., présenté 1911, publié 1920.

1912. P. J. BLOK. Geschiedenis eener Hollandsche stad II. Den Haag, M. NIJHOFF, 298 p.

1914. H. AVERDUNK-J. MÜLLER-REINHARD. GERHARD MERCATOR und die Geographen unter seinen Nachkommen. *Petermanns Mitteilungen*, Ergänzungsband 182, 188 p.

1916. J. VAN DEVENTER. Nederlandsche steden in de 16e eeuw. Plattegronden. 's Gravenhage, M. NIJHOF 1916-23. (These maps were drawn between 1558 and 1570).

1923. W. NIJHOF-M. E. KRONENBERG. Nederlandsche bibliographie van 1500-1540, s' Gravenhage, M. NIJHOF, 1002 p.

1928. F. GRUNDEL. Die Mathematik an den deutschen höheren Schulen I, TEUBNER, Leipzig, 110 p.

1929. C. P. BURGER. ABC-penningen of rekenpenningen. *Het Boek* 18, p. 193-202.

1931. D. J. STRUIK. "Het woord millioen" in oude Nederlandsche rekenboeken. *Tijdschrift voor Nederlandsche taal- en letterkunde*, 50, p. 173-79.

1935. M. L. SCHULTE. Additions in Arithmetic 1483-1700. Diss. Michigan, 99 p.

1935? R. DE ROOVER. JAN YMPYN. Ed. Veritas, 21 rue des Tanneurs, Antwerp, 30 p.

1935. A. POGO. GEMMA FRISIUS, his method of determining differences of longitude by transporting timepieces (1530), and his treatise on triangulation (1533). *Isis* 22, p. 469-506.

Une lettre inédite de Paul Tannery à Frédéric Hultsch [1]

Je m'excuse d'offrir cette simple lettre de PAUL TANNERY; mais, par son caractère personnel et scientifique, elle m'a paru digne de figurer dans un volume de *Mélanges* destiné à honorer la longue et féconde carrière de M. le professeur DAVID EUGENE SMITH. De plus, elle répond à une pensée de M. SARTON, qui m'exprimait il y a quelques années le désir de posséder : « de vrais renseignements sur la pensée et sur la vie de celui qui fut réellement le fondateur de l'Histoire des Sciences » (Lettre du 5 octobre 1922).

La lettre suivante, adressée par PAUL TANNERY à FRÉDÉRIC HULTSCH, révèle le désintéressement et la modestie de l'homme en même temps que l'esprit critique et la profonde culture du savant.

Paris, 2 Janvier 1884.

Monsieur et illustre maître,

Je vous retourne ci-joint le manuscrit que vous désirez publier dans les *Jahrbücher für Philologie*; et je ne puis que vous remercier humblement de ce que vous voulez bien dire de moi.

Mais qu'il soit entendu, une fois pour toutes, que si vous désirez publier quelque chose emprunté à l'une de mes lettres, vous pouvez toujours le faire sans me demander aucune autorisation, et comme vous le voudrez, j'entends, soit en citant mon nom, soit en le taisant, soit en reproduisant le texte de ma lettre, soit en le traduisant, soit en le transformant à votre volonté. Votre temps est en tout cas trop précieux pour que vous le perdiez pour des soucis d'aussi peu d'importance à mes yeux.

Je me suis contenté de supprimer, dans la citation du scholiaste que je vous avais envoyée, l'article ὁ devant le mot πνθμήν, parce que vérification faite, il ne se trouve pas dans les deux manuscrits que j'ai collationnés jusqu'à présent.

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(1) Cet article préparé par Mme. Paul Tannery pour le volume I d'*Osiris* dédié à DAVID EUGENE SMITH est arrivé trop tard pour y être inclus.

Je vous ferai remarquer au reste que la phrase en question se trouve traduite dans le DIOPHANTE de XYLANDER (Bâle, 1575), page 11, ligne 14 en remontant, mais inexactement :

Quoniam fundus sesquitertiae rationis est 4 (2).

J'aurais désiré peut-être qu'en traitant cette question, vous discutiez le témoignage contraire de THÉON DE SMYRNE, que vous connaissez, et que je vous rappelais dans ma lettre de septembre. Vous l'eussiez fait avec plus d'autorité que moi et vous m'obligerez à le faire.

Sauf une incorrection d'expression au commencement, *τῶν ... λόγων οἱ ἐν ἐλαχίστοις ... ἀριθμοῖς ὄντες ... πρῶτοι λέγονται* **τῶν τὸν αὐτὸν λόγον ἐχόντων** *καὶ πυθμένες τῶν ὁμοειδῶν*, le texte de Théon est formel; plus loin : *λόγων πρῶτος καὶ πυθμὴν ... ἐπιτρίτων ... ὁ τῶν* $\overline{\delta}$ *πρὸς* $\overline{\gamma}$.

Les manuscrits de Paris que j'ai consultés ne donnent aucune variante.

Ce passage de THÉON est en tous cas intéressant pour l'histoire des mathématiques, en ce qu'il montre le moment où l'on commence à considérer le *λόγος* comme un *τις ἀριθμὸς* et non seulement comme *ὁμώνυμος τινι ἀριθμῷ*.La seconde manière est évidemment la plus ancienne et la seule classique. C'est celle que d'ordinaire suit DIOPHANTE; dans un seul de ses problèmes, il traite au contraire le *λόγος* comme un *τις ἀριθμός*, par exemple il multiplie *ἐπὶ τὸν λόγον* et non *ἐπὶ τὸν τῷ λόγῳ ὁμώνυμον ἀριθμόν*. C'est un des exemples que je puis donner à l'appui de l'opinion que je soutiens dès longtemps, que les problèmes de DIOPHANTE lui sont, en général, très antérieurs, que, relativement, il n'a pas plus d'originalité que n'en a PAPPUS. J'espère que mon édition mettra le fait bien en lumière.

Le mot *πυθμὴν* en général me paraît signifier le plus petit nombre qui jouisse d'une propriété donnée; ainsi, en dehors des significations que vous connaissez déjà, le scholiaste de Diophante l'emploie pour signifier le plus petit multiple commun de deux

(2) Pour cette valeur donnée à la *base épitrite*, voir PAUL TANNERY, *Annales de la Faculté des Lettres de Bordeaux*, 1884, t. I, pp. 95-105, et *Mém. Scient.*, t. 11, n° 34. PAUL TANNERY reviendra bientôt à « l'idée commune, d'après laquelle *πυθμὴν ἐπίτριτος* signifie le groupe des deux nombres 4 et 3, sans indication d'opérations à effectuer entre eux » (Lettre du 20 septembre 1886 à G. ALLMAN, *Mém. Scient.*, t. XIII, pp. 102-3).

nombres ; par exemple, *τοῦτον λέγω (τὸν $\bar{\varsigma}$) τὸν πυθμένα τῶν ἐχόντων ἥμισυ καὶ τρίτον. καὶ ἕτερος ἐλάττων αὐτοῦ οὐχ ἕξει ταῦτα (μόρια)*. Voir XYLANDER, *Scholion ad* I, XXV, pages 34-35. Si je reprends cette question, ce sera sans doute pour traiter des sens différents du mot *πυθμήν* ; mais, pour le nombre géométrique de PLATON, quoique de temps en temps j'essaie quelque nouvelle combinaison (et j'ai bien remarqué que *συζυγείς* peut être pris au moins dans deux significations), je n'ai pas l'intention d'ici longtemps de publier une nouvelle conjecture. Le plus important, pour le moment, me paraît être d'écarter la seconde interprétation de DUPUIS, à laquelle la nouvelle acceptation que nous donnons au mot *πυθμήν* ne peut se plier (3). Je voudrais en outre discuter ou voir discuter une question que j'ai soulevée dans le temps, savoir si la langue mathématique de PLATON était suffisamment fixée pour que nous puissions asseoir des raisonnements dessus. Je suis très revenu de ce que je pensais alors et, dans le célèbre passage du *Théétète* que j'alléguais, (147*d*-148*b*), je voudrais voir substituer partout *δυναμένη* à *δύναμις*. Ici encore je ne puis m'appuyer sur les manuscrits ; du moins, le meilleur de Paris donne les leçons vulgaires. Si cette question vous tentait, je serais heureux de vous la voir traiter en Allemagne pendant que je la traiterais en France.

Oserais-je maintenant vous demander un service réel ? Vous trouverez ci-joint une lettre en latin pour le conservateur de la Bibliothèque de Wolfenbüttel ; seriez-vous assez aimable pour la lui faire parvenir, en y joignant un mot de recommandation personnelle, afin que je puisse avoir une prompte réponse aux questions que j'y pose ?

Votre tout dévoué admirateur,

TANNERY.

(3) Sur cette question du nombre géométrique de PLATON (*République*, 546 c/d) telle que la voyait PAUL TANNERY à ce moment, voir, dans la *Revue Philosophique*, 1883, t. XV, pp. 561-573, les comptes rendus qu'il donnait des publications de FRIEDRICH HULTSCH, *Die geometrische Zahl in Platon's VIII. Buche vom Staate*, et J. DUPUIS, *Le nombre géométrique de Platon, seconde interprétation* (*Mém. Scient.*, t. XI, n° 27).

Gotthelf Bergsträsser †

A great and lovable scholar to whom the History of Science is much indebted died on August 16, 1933, from an accident in the Bavarian mountains in Germany. GOTTHELF BERGSTRÄSSER was born on April 5, 1886 in a small town of Saxony. He studied classical philology at Leipzig, became a teacher at a higher college in Dresden, and returned then to Leipzig, where he began his studies of Oriental languages, of which he quickly made himself a complete master. He was created "Privatdozent" in 1912, with a very profound study "ḤUNAIN IBN ISḤĀQ und seine Schule" (printed in Leyden, 1913), in which he examined the style of the Arabic versions of the greatest translator of scientific works from Greek into Syriac and Arabic. He continued his work on this interesting translation-period (of the Abassid Caliphate during the IXth Cent. A.D.) when he was, during the Great War, a professor of Semitic languages at the University of Constantinople. In this city he found, in the treasures of the Aya Sofia Library, new documents on ḤUNAIN and his translation-work, about which I reported in *Isis*, vol. VIII (1926). Shortly before his untimely death, he published a volume of additions ("Neue Materialien zu ḤUNAIN's Galenbibliographie," Leipzig, 1932). By now having acquired a great and authentic scientific reputation, within ten years after the War he became professor of Oriental languages in Königsberg, Breslau, Heidelberg and Munich in succession. He was a member of many scientific societies and academies, and had many friends amongst the orientalists of three continents. Among his publications concerning History of Science we may mention his edition of *Pseudo-Galeni in Hippocratis de Septimanis Commentarius* (Leipzig, 1914; the *Neue meteorologische Fragmente des Theophrast* (1918); and his extensive analysis of WILLIAM THOMPSON's edition and translation of the Arabic text of PAPPUS' Commentary on Book X of EUCLID's Elements (published in Harvard, 1930). In all these things BERGSTRÄSSER's mastership in Greek, Arabic and Mathe-

GOTTHELF BERGSTRÄSSER
(1886-1933)

matics shewed itself in the fundamental soundness and thoroughness of everything he published. The number of his publications in the domain of History of Science would have been far greater, had his time not been so occupied by so many other scientific duties. He was for some time co-editor of the "Orientalistische Literaturzeitung," of the "Beiträge zur semitischen Philologie," and of "Orient und Antike." He made important studies on certain Neo-Aramaic dialects in Syria and on the Arabic dialect of Damascus. He reedited the famous Hebrew grammar of GESENIUS & KAUTZSCH on completely new lines, and during the last six years of his life, also the "History of the Qur'ān" by NOELDEKE & SCHWALLY. In this latter work, he manifested the profoundness of his searching mind by initiating a series of quite new studies on inedited Arabic manuscripts. I was myself a witness of the enormous care with which he studied scores of MSS. concerning the chapter on Coran-reading alone, editing at the same time, during his sojourns in Cairo, in 1929 and 32, Arabic biographies of famous Coran-readers. He studied, moreover, the phonetics of modern Arabic dialects and made many records of the "melody" of language by phonograph, experimenting partly on children, in the streets of Cairo. His universal erudition allowed him to attack the central problem of Islam which is the Islamic Law. In this domain he published a series of minor essays, and left unfinished a work of basic importance, "Grundzüge des islamischen Rechts," which has happily been edited, in 1935, by BERGSTRÄSSER's most prominent pupil, Prof. JOSEPH SCHACHT (of Königsberg). A mention also should be made of his turcological studies and of an excellent "Introduction to the Study of Semitic Languages," which appeared in 1928.

BERGSTRÄSSER was an acute thinker with an eminent historical and philological mind. Very often, he began the study of a problem from the philological side, but then became attracted by the subject matter which he penetrated to its farthest possible limits. Personally, he was an upright character, a severe critic of his own work as of that of others; always a true friend and an excellent *pater familias*. His untimely disappearance leaves another deep gap in the line of first-rate orientalists so many of whom died during the last five years.

(Cairo, Egypt.) MAX MEYERHOF.

Editorial postcript.—It was my privilege to see our lamented friend a couple of times during my stay in Cairo in November 1931. I first met him at Dr. MEYERHOF's house, and the second time at a dinner after which he drove us all to the Pyramids. I was deeply impressed by his quiet and unobtrusive earnestness. Here was a man who had already accomplished very much and from whom much more could be expected. We will keep his memory green.

G. S.

Das Shoso-in Museum der Ksl. Schatzkammer zu Nara und seine Heilmittel

In der Geschichte Japans nennt man den Zeitraum von etwas über 70 Jahren, in dem Nara in der Provinz Yamato als kaiserliche Residenz und Hauptstadt bestand, die Narazeit. Sie währte vom 3. Jahr der Wadō-Ära der Kaiserin GEMMYŌ — 710 n. Chr. — bis zum 3. Jahr der Enryoku-Ära des Kaisers KWAMMU — 784 n. Chr. — Zu dieser Zeit wurde Nara als Residenz aufgegeben und der Provinz Yamashiro zugewiesen. Unter der Regierungszeit des Kaisers KIMMEI — 552 n. Chr. — wurde der Buddhismus von Korea nach Japan eingeführt. Durch Förderung des kaiserlichen Hofes breitete sich dieser alsbald sehr aus, sodass nach geraumer Zeit viele schöne Tempel in Nara und Umgegend entstanden, zu dem Prinz SHOTOKU — 574-622 n. Chr. — nicht minder. beitrug. Immer mehr Tempel und Klöster entstanden, was sich daraus erklärt, dass die Priester eifrige Förderer des geistigen und materiellen Wohles des Volkes waren wie die christlichen Mönche des Mittelalters in Europa, denn in diesen Tagen waren die Tempel und Klöster Schulen, Krankenhäuser, Apotheken, Waisenhäuser und Altersheime. Mönche waren Schulmeister, Pfleger, Ärzte, Techniker und gaben Kranken und Waisen Freiquartiere, behandelten sie, denn bei der Behandlung der Krankheiten legte man mehr Gewicht auf Gebet als auf Arzneimittel. So waren die Priesterärzte sehr hoch geschätzt und ihre Zahl war nicht gering. Der chinesische Priester KANJIN, welcher im 6. Jahr der Tempyō-Chōhō-Ära — 755 n. Chr. — nach Japan kam, übte neben seiner religiösen Tätigkeit auch die Heilkunde aus und erlangte bald darin einen guten Ruf, behandelte den Kaiser mit Erfolg, starb jedoch im Jahre 763 n. Chr., 77 Jahre alt. Gleich ihm traten die Priester HŌZŌ, HŌREN und HŌEI durch ihre medizinische Gelehrsamkeit hervor. In die Narazeit fällt auch die Errichtung einer Charité auf Befehl der

Kaiserin KOMYO im 2. Jahre der Tempyō-Hōji-Ära — 758 n. Chr., — um darin arme Kranke aufzunehmen. Ebenso soll ein Tempel in Nara eine solche Anstalt besessen haben.

Wenden wir uns wieder der alten Residenzstadt Nara zu. Schon von weitem grüsst uns der goldkupferne Riesenbuddha Daibutsu. Neben dieser weltbekannten Figur besteht eine alte kaiserliche Schatzkammer Shōsō-In in Nara, die zugleich mit der Errichtung der Buddha-Statue ums Jahr 743 n. Chr. erbaut wurde. Sie gehörte zuerst zum buddhistischen Tempel Totaiji, ist aber später dem kaiserlichen Hofe einverleibt worden und besteht in ihrer ursprünglichen Form noch heute, obwohl die Stadt Nara des öfteren von Feuersbrünsten und Zerstörung heimgesucht wurde. Dieses historische Gebäude ist 9 m. hoch, 33 m. lang und 9,1 m. breit. Das Erdgeschoss, welches nur aus dicken Holzsäulen ohne Wände besteht, ist 1 1/2 m. hoch. Im ersten Stock befindet sich die eigentliche Schatzkammer. Zu ihr gelangt man mittels einer Aussentreppe. Genanntes Gebäude heisst auch Mitsu-Kura, d.h. dreiteiliges Magazin. Die Schatzkammer ist im Azekura-Stil ausgeführt. Diese Bauart besteht im gegenwärtigen Japan nur noch bei vereinzelten alten Tempeln und soll nach der Ansicht moderner Architekten den Feuchtigkeitsgehalt der Luft im Innern dieses oft Jahre und Jahrzehnte lang festzugeschlossenen Gebäudes am besten regulieren. Hier in diesem Shōsō-In haben kostbare Gegenstände ihre Aufbewahrung gefunden, welche der Kaiser SHŌMU TENNŌ besass. Er gehörte dem Tempiō-Zeitalter an, 724-748 n. Chr., der Blütezeit der japanischen Künste. Am 21. Juni des Jahres 8 der Periode Tempiō Shōhō — 754 n. Chr. — am Schluss der 7. Woche nach dem Tode des Kaisers, der fünf Jahre vorher schon bereits auf den Thron verzichtet hatte, hat die Witwe des Kaisers KŌMYŌ KŌGŌ das private Eigentum ihres frommen Gemahls dem von ihm gestifteten Daibutsu geweiht. Die Gegenstände, die die Schatzkammer birgt, sind kaiserliche Kronen und Gewänder, Möbel, Musikinstrumente, Tanzmasken, Schach-, Go- und andere Spiele, Ess- und Trinkgeschirre, buddhistische Bilder, Schriften, Gerätschaften u.a. Diese bestehen aus Gold, Silber, Bronze, Eisen, Kupfer, Elfenbein, Perlmutter, kostbaren Steinen, Kristallglas, Schildpatt, seltenen Vogelfedern, goldgestickten Seiden. Neben diesen aufgezählten Gegenständen sind verwahrt uns

interessierende Arzneimittel aus dem Pflanzen-, Tier- und Mineralreich, die teilweise einheimische Produkte sind. Der grösste Teil aber stammt aus Arabien, Persien, Indien und China, über den später näheres gesagt werden soll. Eine Urkunde zählt 60 Sorten von Drogen in 21 Kisten auf, und jedesmal werden diese genau kontrolliert nach den ursprünglichen Einweihungsschriften, wenn eine feierliche Lüftung der Schatzkammer stattfindet. Gegenwärtig wird das alte Shōsō-In Museum einmal im Jahre (November) zwei bis drei Monate lang gelüftet. Die Zahl der Arzneisorten ist in der Urkunde wie folgt bezeichnet — die dem Daibutsu geweihten Drogen verschiedener Sorten —

1. Kiste : Jia-Kō (Moschus), Sai-Kaku (Rhinozeroshorn), Boku-shō (Mirabilite, ungereinigtes Glaubersalz), Sui-Kaku (Wurzel von *Polygonatum vulgare, Desf.*), Shō-So (Strauch von *Polygala tenuifolia Willd*), Hippatsu *(Piper longum)*, Ko-sho *(Piper nigrum)*, Kansui-sheki (Kalkspat.), Amalaku, Amalaka *(Phyllanthus Emblica.)*, Ammala (Amla, mango.), Kuro-wōren *(Radix capitides nigr.)*, Gen shëi *(Mylabris, cichorii pustulosa rubipenis)*, Sei-shō-sō *(Celosia argentea)*, Haku-hi (d.h. weisse Rinde, Wurzelrinde von *Morus alba*), Ri-seki (Gips), Uyo-rio (ferro-oxide), Tai-ihe-uyorio (Abart des obigen), Riu-kotsu (d.h. Drachenknochen), Goskiki-Riukotsu (fünffarbiger Drachenknochen), Rai-gwan (d.h. Donnerkugel, *Mylitta lapidescens*), Ki-Kiu (d.h. Teufelsmörser, *Podophyllum vercipelle*), Sei-sheki-shi (Blausteinfett), Shi-kō (d.h. violettes Mineral, Amethyst).

2. Kiste : Shiō-niu-shiō (Stalaktit), Bin-roji (Semen areca), Ketsu shioyo *(Boschniakia glabra)*, Hazu (Croton), Mushiokushi (Gallae helepenses), Koboku *(Magnolia hypoleuca)*, Onji (Wurzel von *Polygala tenuifolia*), Kaleiloku (Haritaka, Myrobalan).

3., 4. und 5. Kiste : Kei-shin *(Cinnamomum Cassia)*.

6., 7. und 8. Kiste : Gen-kwa *(Daphna Genkwa)*.

9., 10. und 11. Kiste : Nin-jin *(Radix Ginseng)*.

12., 13. u d 14. Kiste : Dai-rou *(Radix-chei)*.

15. und 16. Kiste : Rō-mitsu (Cara).

17., 18. und 19. Kiste : Kanzō *(Radix Liqueritiae)*.

20. Kiste : Shō-tō (Sarkara, Saccharum), Shisetsu (Violettschnee), Kotoritsu (Harz von *Populus balsamifera*), Sheki-yen (Steinsalz Arsenopyrites), J-hi (Igelhaut), Shinerayōshi (Schafsfett aus Silla, Korea), Bō-ki (Wurzel von *Siler divarieatum*), Wun-

mofun (Micapulver), Middasō (Lithorgyrum), Jius-yen (Sal ammoniac).

21. Kiste : Rōdoku (Wolfsgift-Wurzel von *Euphorbia adenochlorax*), Ya-katsu (Wurzel von *Rhus toxicodendron*). Über ihre Anwendung und Wirkung soll später noch gesprochen werden.

Zu den Einweihungsriten hatte man folgende Bemerkungen angeführt: Jeder, welcher krank ist, soll sich an den Vorsitzenden des Tempels wenden, der durch kaiserliche Erlaubnis über den Gebrauch der Arzneimittel verfügt. Mögen alle, die von den Arzneimitteln genommen haben, von allerlei Leiden befreit sein, alles Gute gelingen und alles Böse schwinden, ausser der Sünde. Möge kein plötzliches Unterbrechen ihres Lebens eintreten und nach dem natürlichen Tode sollen sie in dem ewig blühenden Paradies in der Nähe des Dai-Butsu bleiben. Nicht selten wurde von diesen Arzneimitteln Gebrauch gemacht, besonders in der seit dem Jahre 730 n. Chr. bestehenden Armenheilanstalt (Se-Yaku-in). Aber auch einzelne Personen baten sich solche aus. Von den Medikamenten haben sich bis auf den heutigen Tag etwa 26 Sorten gut erhalten. Selbst die Rinden, Wurzeln, Früchte und Knospen haben nicht gelitten. Um sich einen Begriff von der Wirksamkeit und Anwendung der Medikamente, die die Schatzkammer im Shōsōin-Museum birgt, zu machen, erscheint mir ein geschichtlicher Überblick über die Theorie der altchinesischen Medizin und Pharmakologie für notwendig.

Dass die Heilkunde in China vor Jahrtausenden auf einer viel höheren Stufe stand als in Europa, beweisen uns altchinesische Lehrbücher und neuerdings medizingeschichtliche Forschungen. Es gibt eine grosse Anzahl von Legenden über die Begründer der chinesischen Medizin. Da ist zunächst der Kaiser SHEN-NUNG, dessen Zeit verschieden angegeben wird, 3700 v. Chr. und 2737 v. Chr. Man sieht ihn als den Vater der chinesischen Medizin an. Er soll auf Grund eigener pharmakologischer Experimente — er probierte jeden Tag verschiedene Gifte am eigenen Körper aus — die Pharmakologie begründet haben. Doch zweifelt man an, dass er jemals gelebt hat. Gegenwärtig ist nur noch ein Exemplar vorhanden von dem Medizinwerk *Nei-ching*, dem Canon der chinesischen Medizin, dessen Verfasser man in dem Kaiser HUANG-TI (2697-2597 v. Chr.) sieht. Jedoch hält man das für unwahrscheinlich, wie die chinesischen Medizin-

geschichtsforscher Dr. BACKIANG LIANG und K. C. WONG behaupten, denn es wird vor der Han-Dynastie (206 v. Chr.-219 n. Chr.) in keiner Weise in der alten Literatur erwähnt. Was die vier Bücher für den Konfuzianer sind, ist das *Nei-ching* für die chinesischen Ärzte, und es steht heute noch in hoher Achtung. Ich will es mit dieser kurzen Andeutung genug sein lassen und nur noch die Materia medica des TAO HUNG-CHING aus der Lian-Dynastie 452-526 n. Chr. anführen. Das Werk umfasst 7 Bände in zwei Teilen. Der erste enthält das alte *Shénnung-Pentsao-ching* systematisch geordnet, der zweite die Liste von Arzneien aus den Rezepten späterer Ärzte. 730 Medikamente werden in beiden Teilen erwähnt. 689 erschien dann eine neue Materia medica, *Tang-hsin-pentsao*, worin man neben den in TAOS Werk aufgeführten Arzneien noch 114 Sorten aus allen Teilen des Reiches findet. Das neue Buch, das 21 Bände umfasst, ist ferner reichlich mit Tafeln und Figuren ausgestattet. Man nimmt an, dass diese beiden Werke zur Zeit des Kaisers SHŌMU-TENNŌ 723-748 in Japan eingeführt worden sind, denn es finden sich unter den 60 Arzneisorten, die dem Daibutsu geweiht wurden, 43 Sorten in dem alten Teile des *Shennung Pents'ao-ching* wieder. Auch finden sich im Buche *Shang-hon-lun* des chinesischen Hippokrates CHANG CHUNG-KING, der am Ende des zweiten nachchristlichen Jahrhunderts lebte, viele Arzneinamen, die in der Liste des Shōsō-In stehen. Wahrscheinlich wurde dieses letztgenannte Buch von den japanischen Heilkundigen vor dem 8. Jahrhundert studiert, desgleichen das Werk *Chen-kin-hao*, ein Therapiebuch, tausend Stücke Goldes wert, aus der Zeit der Tang-Dynastie, in welche auch unser Tempiō-Zeitalter 729-748 fällt. Dass Zivilisation und Kultur in China und Japan auf hoher Stufe standen, beweisen die wertvollen Gegenstände verschiedener Art, die die kaiserliche Schatzkammer zu Nara birgt.

Im Anschluss sei noch einiges über das Medizinalwesen in Altchina vor 2000 Jahren zu berichten, über das das Buch *Chou-Li* aus der Feder des weisen Staatsministers CHOU-KUNG (1105 v. Chr.), durchgesehen von KONFUCIUS und von späteren Autoren mit vielfachen Kommentaren versehen, Aufschluss gibt. Zu dieser Zeit gab es fünf Ärzteklassen. Der einfache Arzt hatte die Aufgabe, Arzneien im Lande zu sammeln und dieselben zu verteilen. Der Küchenarzt hatte sich mit der Wahl der Speisen

für die Küche des Kaisers zu beschäftigen. Für die Behandlung von allerlei inneren Leiden des Volkes war der Krankenarzt zuständig, desgleichen der Wundarzt für Geschwüre, Abszesse, Schnittwunden, Knochenbrüche. Seine Behandlung bestand im Eingiessen von Arzneien auf Wunden, in der Entleerung des Bluteiters und Ätzung des schlechten Fleisches; zuletzt der Tierarzt. Über den Küchenarzt heisst es nun im *Chou-Li*, dass man für die Küche im Frühling mehr Saures, im Sommer mehr Bitteres, im Herbst mehr Scharfes und im Winter mehr Salziges zu wählen habe, im weiteren noch glattsüsse Speisen, die zur Ausgleichung des Geschmackes dienen sollen. Diese fünf Geschmäcker gelten auch für die Eigenschaften aller Medikamente. So soll der Krankenarzt seine Kranken mit fünf Geschmacksmitteln, fünf Getreide- und fünf Arzneiarten nähren, der Wundarzt die Wunden mit fünf Giften angreifen, mit fünf Gasen nähren und mit fünf Arzneien behandeln. Ferner hat er die Kranken mit fünf Geschmacksarten zu pflegen, und zwar nähren saure Speisen die Knochen, die scharfen die Muskeln, die salzigen die Adern, die bitteren die Pneuma des Körpers und die süssen die Haut, während die glatten die Funktionen der Körperöffnungen regulieren. Nach CHING-HSÜAN (Ost-Han Dynastie 25-220 n. Chr.) sollen jene fünf Gifte aus Schwefeleisen, Quecksilbersulfid, Arsensulfid, Arsenoxyd und Ferrum bestehen. Die fünf Arzneien nach Angaben des Arzneibuches *Shennung-Pentchao-Kin:* Kräuter, Holz, Würmer, Steinarten, Getreide. Getreidearten, die dazu dienten, waren *Cannabis sativa*, L., *Triticum vulgare*, *Glycine hispida*, Maxim und zwei Varietäten von *Panicum miliaceumi*. Die fünf Geschmackssorten Salz, Essig, Wein, Honig, Ame und Ingwer. Daraus kann man ersehen, dass die chinesische Materia medica alles umfasst, was den Menschen nicht allein zur Heilung der Krankheiten dient, sondern auch als Nahrungs- und Genussmittel, speziell aber zum Zwecke des Langelebens und zur Steigerung der Sinnlichkeit. Hierbei sei kurz auf die fünf Elemente eingegangen. Von uralter Zeit her herrschte in China die dualistische Theorie, wonach das Weltall aus Licht und Schatten besteht. Danach entstand gegen Ende der Chou-Dynastie jene Lehre der fünf Elemente: Holz, Feuer, Erde, Metall und Wasser. Diese bildete in den folgenden seit den ersten christlichen Jahrhunderten die Grundlage aller physikali-

schen wie metaphysischen Wissenschaften. In der Medizin fand diese Theorie ebenfalls Anwendung. Man rechnete alle Körperteile und Eingeweide (namentlich die sog. fünf soliden und sechs hohlen Organe im Thorax) zuerst entweder dem Licht oder dem Schatten, dann im speziellen Sinne diesem Fünfelementensystem angehörig zu. Ähnlich verhielt es sich mit der Pharmakologie, indem man jedes Medikament nach Ursprung und Eigenschaft mit den fünf Elementen in Verbindung brachte, bei einer Störung der gegenseitigen Wechselbeziehungen der anziehenden und abstossenden Elemente, welchen das menschliche Organsystem unterliegt. Entsteht nun eine Krankheit, und zwar entwickelt sie sich entweder von innen durch die abnormen Funktionen einzelner Organe oder des Organsystems, oder von aussen her durch Schlag des Windes, wodurch Stauung des Wassers der Pneuma oder Verunreinigung des Blutes veranlasst werden, so wurden die geeigneten Arzneimittel genommen, um die Regulierung der gegenseitigen Wechselbeziehungen zwischen den Einzelelementen im Körper zu erzielen. So erklärt es sich in der chinesischen Medizin, dass der Hauptzweck der Einnahme von Arzneien im Langeleben, Erhalten des Geschlechtslebens und zuletzt in der Heilung von Krankheiten besteht. Zum Zweck des Langelebens kann der Chinese sie fortwährend, zur Erhaltung der geschlechtlichen Potenz längere Zeit, jedoch mit Unterbrechung, anwenden. Bei Krankheitsbeseitigen sollen diese nicht lange fortgesetzt werden, da sie giftig seien.

Es folgt nunmehr die Beschreibung der Arzneimittel und Drogen, die sich in der Ksl. Schatzkammer Shōsō-In zu Nara befinden. Da wäre Moschus, vom Moschustier *(Moschus moschiferus)*, zu nennen. Es lebt in Ost- und Zentralasien. Die Wirkung ist scharf warm, wohlriechend, ungiftig, erweitert die Adern, macht alle Körperöffnungen durchgängig, durchdringt Fleisch und Knochen und wird gegen Apoplexie und sonstige Krankheiten angewendet, die auf Wind, Pneuma und Blut Bezug haben, stillt Schmerzen, beseitigt Auswurf, epileptische Anfälle, Fäkalballen und Bauchauftreibungen; wirkt auf Nasenverstopfung, Taubheit, Augentrübung, schützt vor schlechten Gasen, löst das Gift auf, tötet Würmer, bewirkt Abortus, heilt Magenüberladung und Trunkheit. Rhinozeroshorn (Siam, Sumatra, Cochinchina und Afrika) wirkt bitter, salzig-kalt, kühlt die Brust, fördert die

Leberfunktion, schützt vor schlechten Gasen, löst Gift auf, heilt Fieberkrankheiten, Ikterus, Hämoptoe, Blutuntergang, Blutunterlauf, erweicht den Karbunkel, fördert die Eiterung, beseitigt die Erregbarkeit, verstärkt die Sehkraft, kontraindiziert bei der Schwangerschaft, wird auf Reibeisen pulverisiert, in Dekoktum oder heissem Wasser eingenommen. Ferner *Polygonatum vulgare*. Es gibt I.-Sui, das mit ihm das Schriftzeichen Sui gemeinsam hat. Es ist die Wurzel von *Polygonatum officinale* und wendet es gegen Feuchtigkeitsleiden und Kopf- und Lendenschmerzen an. Im *Ishimpo*, einem alten japanischen Medizinwerk vom Jahre 984, wird das Mittel gegen die Sehstörung, den Tränenfluss (Bd. 5), oder auch gegen das Leberleiden (Bd. 6) angewandt. Im weiteren nenne ich *Polygale tenuifolia*. Dieses als Expektoran beliebte Mittel erwarb in der alten chinesischen Heilkunde als stärkendes und lebensverlängerndes Mittel grosses Ansehen. Piper long, aus Südseeländern stammend, wirkt scharf-heiss, erwärmt den Magen oder das Innere überhaupt und unterdrückt die Kopfkongestion. Auch wendet man es bei Darmgurren an. *Phyllanthus emblica*, dessen Name im 13. Bd. des *Pents'ao-Ching* von TAO im Kapitel der Holzarten, zu welchen *Magnolia hypolenca*, *Areca Catechu*, *Morus alba* gehören. Im *Ishimpō* wird Amaloku als ein fremdländisches Produkt bezeichnet. Es wirkt bitter-süss-kalt, giftlos, wird gegen Erkältungsfieber gebraucht. Das Öl aus den Früchten wirkt ferner als Haarmittel. Radix capitidis ist eine einheimische Pflanze und enthält Berberin, wirkt appetitsteigernd. Ausserdem reinigt es schlechtes Herzblut, löst Fötalgift auf und beseitigt die Erregbarkeit. Die versteinerten Knochen und Zähne des Mastodon, Biston priscus, in der Vorwelt werden in verschiedenen Gegenden Chinas aus der Erde gegraben und als Arznei gebraucht. Die im Shōsōin Museum vorhandenen Drachenknochen sind weiss, hart wie Stein und lassen beim Berühren ein wenig Pulver an den Fingern zurück. Das Drachenhorn ist hohlmarkig und verzweigt wie Hirschhorn ist, von einfach süsslichem Geschmack, schützt vor dem Teufel und beruhigt den Geist, pulverisiert gegen Malaria oder andere Fieberkrankheiten. Die Chinesen nehmen das Mittel, nachdem das Pulver mit Kochsalz in einem irdenen Gefäss mit fest schliessendem Deckel stark erhitzt worden ist. Das Knochensalz wird dann vor dem Einnehmen entfernt. Eine Art Pilz, der in der Erde von Bambus-

büschen wächst, *(Mylitta lapidescens)*, dessen rundliche bohnengrosse Form wird in Wasser gelegt, dann die schwarze Schale entfernt, in 4-5 Stücke geschnitten, abgedampft und an der Sonne getrocknet. Er wirkt bitter-kalt, fördert Schweissekretion. Bei allzu langem Gebrauch wird Impotenz verursacht. Im Shōsōin-Museum ruht gegenwärtig noch Rotsteinfett (seki-seki-shi), das ziegelrot aussieht, glatt und weich wie Talkum sich anfühlt. Ganz ähnlich sieht das Rotsteinfett von der Sammlung Professor NAKAO im Museum Port-Arthur aus, das nach seiner Ansicht eisenhaltiger Ton sein soll. Professor HÜBOTTER hält das Rotsteinfett für Aluminiumsilicat, das aber viel härter sein muss. Die Wirkung ist gegen Ikterus und eiternde Prozesse. Es wird in Pulverform mit frischem Wasser gereicht. Semen Areca ist eine Frucht von *Arcca catechu* (Ostindien), Indikation gegen Trockenheit, Brustleiden, Bauchtumor, Malaria und andere miasmatische Krankheiten, Ödem, Beri Beri, Verstopfung, Tenesmus. Man gibt es geröstet oder in Wasser oder mit Essig gekocht, meist mit anderen Mitteln zusammen in Pillenform. Croton stammt aus Indien und China, wirkt bei Schlangen- und Skorpiongift, ferner führt es das Gestaute ab. Das Präparat Gallae helepenses wird gewonnen aus an den Zweigen von *Quercus infletoria* Oliver, die in Persien wächst, legt *Cynips gallae tinctoriae* ihre Eier unter die Rinde. Mit der weiteren Entwickelung derselben bilden sich dort kleine rundliche Knoten, die schwachgelb bis graugrünlich aussehen. Nach dem Ausschlüpfen der Wespe bleibt ein Loch zurück. Die Wirkung ist bitterlich, äusserlich gegen Genitalausschläge und Schweiss, Mundaffektionen und dergleichen. Die Wirkung der *Magnolia hypoleuca*, eine dickfleischige violettfarbene Rinde, ist von bitterer Eigenschaft. Ihr scharfer Geschmack erwärmt und treibt die Feuchtigkeit aus. Als Fiebermittel gegen Typhus, akuten Durchfall, ferner gegen Nervosität, gilt auch als Diuretica. Im *Shang-han-lun* findet sich das Mittel auch als Brechmittel verordnet, wird als Pillen oder als Dekokt mit Zutat von Ingwersaft dargereicht. Radix ginseng : in China gilt das Mittel aus der alten Zeit her als teures Wundermittel zur Stärkung der Gesundheit, der geistigen wie sinnlichen Kräfte. Die in der Schatzkammer im eichenen " Gosu " aufbewahrte Rinde ist ziemlich gut erhalten. Saccharum : zu dem heisst es, dass ein chinesischer Priester KAMHIN im 5. Jahre

der Periode Tempio-Shoho 753 den Zucker nach Japan mitgebracht haben soll. Man nimmt ihn zur Anregung der inneren Funktion, wie Milz, reguliert die Hitze, löst das Sputum auf, fördert den Stuhlgang und die Harnsekretion. Die Igelhaut, Haut von *Erinaceus auritis*, wendet man zur Heilung der Hämorrhoiden und Fistula ani an. Lithargyrum fördert den Auswurf, bewahrt vor Erschrecken, tötet Würmer, äusserlich gegen Bromidrosis und als Bartfärbemittel.

Ich habe aus der Fülle der Medikamenten-Sammlung, die die kaiserliche Schatzkammer zu Nara birgt, die wichtigsten und wertvollsten zur Kenntnis gebracht. Möglich ist, dass es noch mehrere bedeutsame gibt, doch sah ich davon ab, da sie zum grössten Teil gleiche Indikationen haben.

Zum Schluss möchte ich nicht unerwähnt lassen, dass die Arzneisammlung zu Nara von historischer Bedeutung ist, gibt sie doch einen Einblick in die medizinischen Kenntnisse und Einrichtungen des damaligen Japan und hat ferner den Beweis erbracht, dass pflanzliche Drogen bei geeigneter Vorsicht sich lange haltbar zeigen. Das Gebäude diente zu gewissen Zeiten nicht selten armen Bettlern als Obdach, welche zur kalten Jahreszeit sich dort am Feuer erwärmten. Die Schätze, die in der Schatzkammer aufbewahrt werden, stammen nicht aus Ausgrabungen der Asche eines Vulkanausbruches, oder aus zertrümmerten Ruinen oder gar aus der tiefen Gruft himmelhoher Pyramiden. All das trifft bei dieser Sammlung nicht zu. Diese Heilmittel sind dem Schutze des Volkes übereignet worden über tausend Jahre lang, und man wird in der Welt solches gleichen nirgends finden als in dem Reiche des Mikados.

Anmerkung

Kurz sei hier anschliessend bemerkt, dass die Beuroner Benediktiner-Kongregation zur Zeit ein Kloster am Fusse des Fusi-jak im Westen von Yokohama (Japan) errichtet, sodass man von diesen Mönchen sicherlich noch manche Wissenserweiterung auf dem Gebiete der japanischen Pharmakologie erwarten kann.

Berlin. Richard Brachwitz.

Chinese glass of the beginning of the Confucian age

The accepted views concerning Chinese glass were until quite recently the following. During the Han dynasty, Roman glass was imported into China from Egypt and (or) Syria, but the Chinese did not manufacture any glass themselves before the fifth century of our era. Strangely enough about that time the manufacture of it was introduced independently in North China and in South China. For more details on those views, see SAMUEL COULING : *Encyclopaedia sinica* (207, 1917) and my *Introduction to the history of science* (vol. 1, 389, 1927). It will suffice to recall that this consensus of opinion was based in the first place upon the absence of early specimens of Chinese glass, and in the second place, upon the Chinese annals, which were either incorrect or misunderstood.

Within recent years Chinese archaeology has made enormous progress thanks to the activities of many Western scholars and of their Chinese and Japanese colleagues, and our knowledge of the subject is being gradually transformed from top to bottom (1).

One of the most important additions to our knowledge is due to the zeal and perspicacity of the Right Reverend WILLIAM CHARLES WHITE, sometime bishop of Honan, associate professor of archaeology in the University of Toronto, and keeper of East Asiatic collections of the Royal Ontario Museum. Being stationed in Kaifeng, he had noticed since 1929 that a number of beautiful objects were coming from the region of Lo-yang, —presumably from a Ch'in tomb. In the winter of 1930-31, there appeared two bronze bells bearing inscriptions, the larger one including a date equivalent to 550 B. C. (2) Other inscribed

(1) For example, see my review of J. GUNNAR ANDERSSON : *Children of the yellow earth* (London 1934; *Isis*, 23, 271-5).

(2) This is the date accepted by most Chinese scholars. However, according to KUO MO-JO the date should be read as equivalent to 380-79 B. C.

bells were gradually recovered, fourteen in all, five large ones and nine small ones, all of which are kept in China, except one of each kind which are in the Royal Ontario Museum. Bishop WHITE traced those objects to their source and was thus led to the systematic excavation of the tombs of which I shall speak presently.

My attention was first drawn to Bishop WHITE's wonderful discovery by an article in the *Illustrated London News* of May 12th, 1934; a second time during a visit of the Royal Ontario Museum on June 28-29, 1935 under the direction of its genial creator and animator, Professor CHARLES TRICK CURRELLY; a third time when I studied Bishop WHITE's own account sumptously published last year in Shanghai (3).

I cannot deal with the objects excavated for this would lead me too far : I must refer the reader to Bishop WHITE's book, or better still, advise him, if it is at all possible for him, to visit the Toronto museum, one of the most interesting museums of the New World.

Before speaking of the glass, I shall indicate briefly but exactly the locality of the tombs excavated and their date.

Locality.—The tombs were found in old Lo-yang (Ch'êng Chou), some thirteen miles northeast of modern Lo-yang in Western Honan, approximately Lat. 34°45', Long. 112°37'.

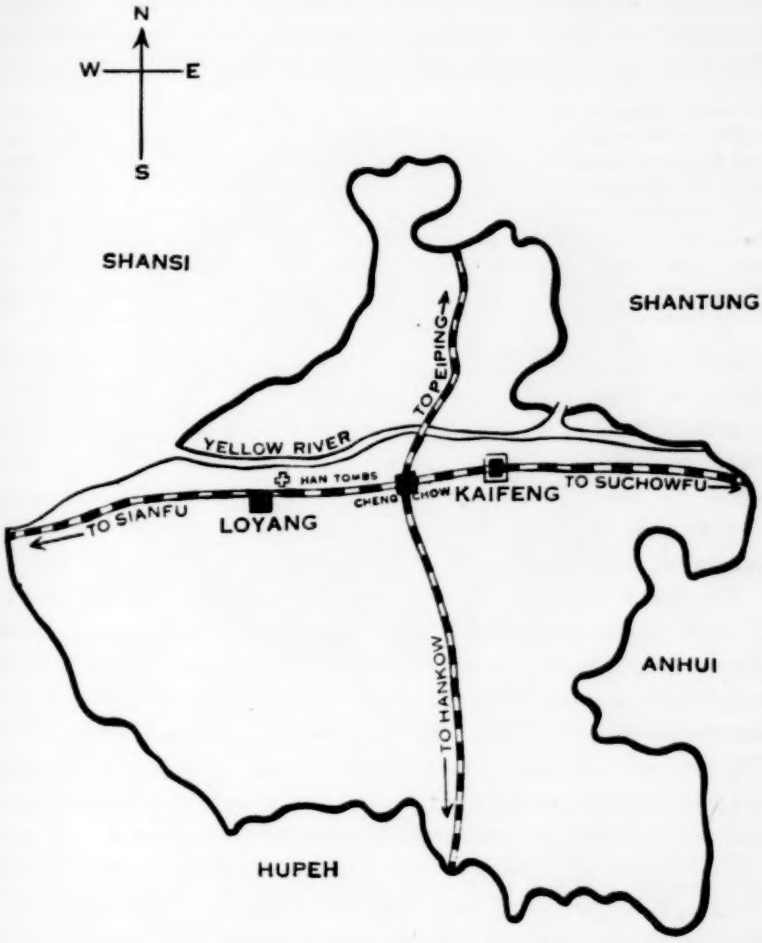
Soon after the defeat of the Shang-Yin dynasty and the establishment of the Chou (1122), the Duke of Chou, brother of the first emperor WU WANG (1122-1115) realizing the need of a secondary capital in Honan (the main capital was at Hao in Shensi) founded the city of Wang Ch'êng (the kingly city), the site of which almost coincides with that of modern Lo-yang. A few years, later the same Duke founded in the neighborhood, the old Lo-yang, calling it Ch'êng Chou (completion or accomplishment of the Chou). Ch'êng Chou served as a residence (or place of captivity) for the defeated princes of the Shang-Yin family.

The capital oscillated between these two cities : Wang Ch'êng

(3) WILLIAM CHARLES WHITE : *Tombs of old Lo-yang*. A record of the construction and contents of a group of royal tombs at Chin-ts'un, Honan, probably dating 550 B. C. Foreword by JOHN C. FERGUSON. xx, 180, xxii pag., 187 plates, 5 maps and plans. Shanghai, Kelly & Walsh, 1934.

became the capital in 700; Ch'êng Chou was the capital from 519 to 314 B. C., then Wang Ch'êng again. The Chou dynasty was superseded by the Ch'in in 255 B. C.

I have entered into these details to show that these two places are well determined and have been so for more than three



millennia, and to clear the confusion between the so-called old and new Lo-yang, the new being apparently a few years older than the old.

Date.—The date of the tombs is derived from the inscription on a bell. Says the author (p. 14) :

"The first clause in the inscription reads. 'In the 22nd year,' and since the 'Son of Heaven' is mentioned farther down in the inscription, it is accepted as unquestionable that the inscription refers to the 22nd year of one of the Chou kings. Eliminating those who reigned less than 22 years, and checking up the historical incidents mentioned in the inscription, Chinese scholars have come to the conclusion that the emperor referred to must be either LING WANG (571 to 544) or AN WANG (401 to 375). The majority favour the LING WANG date, which would be 550. The later date would be 379. Both interpretations are obtained in an attempt to explain the historical references of the inscription, and have been influenced in no way by knowledge of the construction of the tombs or their contents, which until now have not been known. The arguments for the earlier date are very strong, and the only objection to accepting that date would be the stylistic evidence of the objects from the tombs, which would hitherto be considered as of a later period. To get over the difficulty it has been suggested that possibly an earlier set of bells found its way into a later grave. This would be a reasonable possibility if only one set of bells was concerned, but there were bells of thirteen different sets obtained from these graves, all of the same style, though only two sets carried inscriptions, and it seems most improbable that thirteen sets of earlier bells should be handed down over a period of 170 years or so and then buried in several graves of a common group."

Accepting the date 550 B. C., the large collection of objects found in these tombs give us a knowledge of that age which is considerably larger than that hitherto available, and it is the more important because it was one of the critical periods of China, when the old feudal system was breaking up. It is interesting to note that it was about that time that CONFUCIUS (551-479) was born, who was to be the greatest educator of his race.

The glass obejcts.—One of the most curious characteristics of these tombs is the use of glass for decorative purposes, small pieces of it being mounted in plaques of bronze, in girdle hooks and finials; a great many beads of various sizes and shapes were also found, but no glass objects complete in themselves. The Chinese of the sixth century B. C. knew how to make glass, but had not yet applied their ceramic technique to that substance, and had not yet learned to make glass vessels.

The strangest feature of those glass ornaments and of some of the beads is the "eye" motif. Consider for example the illustration of object 401, which we reproduce and which is described as follows (p. 148) :

"Gilt bronze plaque, with three slightly fluted bands, and the centre inlaid with a convex-shaped glass disc, decorated with 'eyes' design. These 'eyes' were white on a dark-blue background, with dark-blue pupils. In the centre one 'eye' faced directly outwards and had three white circles around it. Around this 'eye' was a circle of seven 'eyes' revolving counter-clockwise.

Outside of this again was another circle of seven 'eyes' revolving clock-wise. There were several of these plaques. Diameter 2.75 inches."

The arrangement of eyes in such dynamic fashion—as if to convey an impression of movement around a fixed center—occurs in many other objects.

The main point to remember is that we have here Chinese glass (not Roman importations) about a thousand years older than the accepted date of the invention of glass in that part of the world.

Bishop WHITE's find is a sufficient proof, but it does not stand alone. To use his own words (p. 50):

"Discoveries of glass in prehistoric graves in Japan and in early graves in Korea, as well as glass discs and other Chinese forms from Shou-chou, Lo-yang and other points in north China, seem to show that glass in ancient China was more common than has been taken for granted. A small cylinder shaped object of green glass deeply encrusted with a calcified covering was found with cowries in the Hsin-cheng finds, which might well be the 5th or 4th century B.C. A dark green glass disc of *kung-pi* form nearly four inches in diameter and obviously made in a mould, came from Shou-chou with certain bronze objects found with it which were doubtless of 3rd century B.C. type. Glass beads and small objects appeared in finds in north Honan with bronzes of a style of decoration usually associated with the Ch'in period."

An analysis of that Chinese glass made by H. C. BECK and

C. G. SELIGMAN (4), revealed the presence of barium in all probability derived from the materials from which the glass was made. This is a very useful characteristic, for no barium has yet been detected in the glass of Mediterranean origin.

When I applied to Bishop WHITE for permission to reproduce the map and figure illustrating this note, he very kindly sent me additional information. He had the great generosity of communicating to me, six letters written to him by Dr. SELIGMAN from May 13th 1934 to Jan. 28th 1935 and an unpublished report "Report No. 94 on 10 glass beads and 2 shell beads from early graves in China submitted by Bishop WHITE " (4 typewritten pages with 10 photographs).

The specimens examined (in that report) vary considerably with regard to colour, shape, and density (the specific gravity ranging from 2.325 in No. 10 to 5.10 in No. 3). The ancient Chinese glass does not always contain barium, and a high specific gravity is not necessarily due to barium, for it may be due to lead. The colors are due to cobalt, copper or iron.

Some of the types defined in Bishop WHITE's Report come nearer to the Mediterranean types. For example, No. 6 " eye bead of a new type," of specific gravity 3.937 is described as follows :

" This bead has 6 eyes which are moulded so as to bulge out to hemispheres. The base consists of a yellow glass which has corroded white. The eyes appear to be made of the same material as the base.

" A glass which corrodes in a similar way has been found at Rhodes and at Ur. At the latter place special eyebeads have been found consisting of large black rings on a yellow base. These have corroded away until the whole surface of the bead has become a similar white colour to this Chinese bead. The corrosion seems to be entirely below the surface which still retains a polish. Except for the corrosion the Ur beads resemble beads of the XVIIIth to XXth dynasty in Egypt."

Again, bead No. 9. This bead is the same as some of those found in an Egyptian grave at Qau. Sp. g. 2.389. " 8 eyes pale blue base. Each eye has a dark center with two white and one dark ring round it."

Bead No. 10 " although slightly different from No. 9 is a type found in Egypt and the Mediterranean." Sp. g. 2.325.

" This bead has 6 eyes. It has not got a blue base like No. 9 but a white one.

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(4) Barium in ancient glass (*Nature*, June 30, 1934, p. 982).

Each eye has a dark blue centre and one white and one brown ring. The brown may originally have been blue.

"By arrangement with Bishop WHITE bead No. 9 was exchanged for a similar Egyptian bead and has been broken to show that the internal structure was the same as the Egyptian."

Dr. CURRELLY suggests another similarity, that is, one between the Lo-yang beads and early Greek glass, "a very close affinity" he calls it (letter from Bishop WHITE to me, Dec. 5, 1935),—but there is no barium in the Greek beads.

These similarities between Chinese beads and Mediterranean ones are as remarkable in one way, as the difference between the "barium" Chinese beads and the Mediterranean ones is in another. In any case the invention of Chinese glass must be dated back a thousand years, and the Chinese literary documents should be reexamined in that light. We may expect more information from other excavations and it may be possible, by and by, to write a history of Chinese glass vastly different from the one which I summarized in the first volume of my *Introduction*.

I beg to thank the Right Rev. Bishop WHITE for the very generous help which he extended to me.

Cambridge, Mass. Dec. 9, 1935. GEORGE SARTON.

Ideas of Creation and Spontaneous Generation prior to Darwin.[1]

One usually says that before the theory of evolution was generally accepted, the belief in the special creation of organisms was predominant. The situation was, however, not so simple. The belief in a creation was not the only concept and the idea of creation had been given various meanings.

To us the question of the origin of organisms is simple, or at least, ought to be so. There are only three possibilities; ***mechanical spontaneous generation***, even of highly organized beings, from inorganic matter; ***supernatural creation***, and ***evolution***. A creation of living beings "out of nothing" has probably never been taken into consideration, and even the Bible speaks expressly of a creation "out of clay." The ideas, alike of spontaneous generation and of creation, thus presuppose a process homogeneous in its material course. In the one case, a purely mechanical generat on, and in the other, a supernatural intervention in the course of nature; but in both cases, a formation, even of the most complicated organisms, directly from inorganic matter. For modern science such a thought is entirely out of the question, and no reader of this paper will take it into consideration (though there are people who have not yet realized the possibilities that exist). The theory of evolution is, therefore, for us, not merely a scientific hypothesis, but a logical necessity.

But it has not always been so. Even HUXLEY, the ablest champion of evolution in the early period of Darwinism, admits that creation, in the ordinary sense of the word, seems to him "completely understandable." One should not be too much surprised at this, since even the most acute and critical scientists are children of their time.

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(1) Summary of a Swedish paper: Skapelsetro och uralstringshypoteser före DARWIN. Uppsala Univ. Arsskrift, 1928, 71 pp.

The slow ripening of the theory of evolution is fairly well known, but so far, little attention has been given to the history of the ideas of spontaneous generation and creation. It is, however, of extreme interest to follow the history of these ideas and the conditions for their existence through time, their changes, their struggle, their decline, and final end. The history of no other science is to so large an extent a history of ideas as is that of biology.

Antiquity

The belief in a spontaneous generation of plants, minute animals, eels, and frogs, was widespread during antiquity. The doctrine of the philosophers of the generation of such organisms, and even of human beings out of clay or slime, was not a scientific theory but one derived from ideas common to all forms of primitive mythology. Even for the atomistic natural philosophy the boundary between inorganic matter and living organisms was easy to cross. Empedocles is wrongly looked upon as being a primitive predecessor of Darwin. His famous principle of selection was not combined with an idea of evolution.

For Plato the world of ideas only had a real existence. All the individuals of a species are imperfect images of an eternal idea, and the differences between the organisms are part of the plan for the perfect universe. The question of the origin of organisms was of no significance to this doctrine which has been, up to the present time, of incalculable importance in biology, philosophy, and for the general view of life.

For Aristotle, things are units of matter which is potentiality, and form which is at the same time cause and purpose. The world is the expression of a purposeful realizing of self (entelechy) and forms an ascending series which begins with formless matter and ends with pure form, the Divine. The animal kingdom forms a series of more or less unsuccessful attempts to create man. Aristotle has been considered a pioneer of the biological theory of evolution. By his clear formulation of nature's perfecting principle he has founded a general philosophic theory of evolution, but not the biological theory of evolution, viz., the theory of descent. The gradual ascent is to him an ascent to higher degrees of *reality*

and *value*, and all degrees are realizations of purpose. The idea of the development of the higher forms of life from the lower is completely foreign to him. Although he discarded PLATO's doctrine of the ideal world as true reality, the question of the origin of organisms existed neither for him nor for PLATO. It has been said (WINDELBAND) that his ascending series of organic life begins with forms arising by spontaneous generation. This is incorrect; spontaneous generation was to ARISTOTLE a process equal to procreation, a process by which, consequently, the origin of individuals, not of species, was explained.

The opinions of LUCRETIUS, which to a great extent were probably taken from EPICURUS, are of interest on account of their concrete form. He believed that eggs and womblike capsules, not complete animals, are produced from the earth. He thus touches upon a problem which was much discussed in antiquity by PLUTARCH and others.

THE PATRISTIC AGE, THE MIDDLE AGES, AND THE RENAISSANCE

The Christian learned to look upon the universe as the creation of God. This naïve belief never questioned how the creation of living beings had come about. Among the fathers of the Church (for their conception of nature see O. ZÖCKLER and W. MAY) there were, however, some who tried to clothe the idea of creation in a mantle of philosophy. The ruthlessly anthropocentric and teleological doctrine of ORIGEN wound up in an allegorical interpretation of the story of creation. The animals in this story represent the evil and the good thoughts of the human heart. By this process creation was released from all connection with natural phenomena, but by it the concept was also freed from the literal belief which later predominated. ST. AUGUSTINE endeavoured to merge neo-Platonic speculation with the doctrines of the Bible and maintained that organisms, as existing in time, had been created in the beginning. However, by the act of divine creation only possibilities were deposited in matter, and the " secondary creation " of plants, animals, and man was looked upon as a natural process, to be compared with the spontaneous generation from the earth which, for a long time

to follow, seemed to be evident. It was not considered to be in opposition to the Biblical idea of creation. Difficulties, if such were to be found, were overcome by the Aristotelian method of reasoning. According to THOMAS AB AQUINO a living being originates by a passive material being fertilized by an active power. In the process of procreation this power is the male sperm, during the process of spontaneous generation it is a sidereal influence, and, during the first creation, it was the word of God.

HARVEY (1651) heralded a new period in the history of biology on account of his new principle of the development of all beings from the egg. He himself did not, however, draw the extreme conclusion from this but presumed that the lower animals were produced by spontaneous generation. The theory of spontaneous generation was refuted by REDI (1668) and SWAMMERDAMM.

The problem seemed to be solved. When spontaneous generation was impossible, divine creation must have taken place. But as long as only these two possibilities could be discerned, the idea of spontaneous generation could not be got over.

DESCARTES

What is great and important in DESCARTES' mechanical explanation of nature is that he did not stop at an explanation of things as they are, but asked how they had originated. Not only did he discard the dogma of creation, but he also propounded *a universal idea of evolution* free from every trace of a teleological concept of nature. Everything, animate and inanimate, has been developed from a simple state of origin, " a kind of seed." He was the first to understand clearly and to express the thought, so obvious to us, that organisms could not have suddenly originated as fullgrown and complete individuals. The purpose of his reservation that Adam and Eve were created as adults is easily seen through. DESCARTES' idea of evolution did not result, however, in a theory of descent, but had an opposite effect, just as that effacing of the boundary between inanimate and animate, which is characteristic of his system. The thought of deriving *every* kind of organism out of a spontaneously generated seed was so natural that DESCARTES did not develop it, and, as it seems, did not even directly express it.

BUFFON

The idea of the formation of higher and lower organisms from inorganic matter did not offer any difficulties to DESCARTES who was a mathematician and philosopher. To biology such a concept after HARVEY's time must have created the greatest difficulties.

In his grandiose attempt to draw up a natural history of the world, BUFFON was not satisfied with philosophical discussions in the lines of abstract *Naturphilosophie* but demanded concrete concepts. The formation of complicated living beings direct from inanimate matter must have appeared absurd to him. He tried to get over the difficulties by introducing between the inorganic matter and the living organisms a kind of living, but not organized, " organic molecules." The idea seems to come partly from LEIBNITZ, partly from MAUPERTUIS. By this hypothesis BUFFON explains everything: growth, propagation, and the origin of all living beings. He strongly emphasizes the unity of nature and its forces, his views as to the origin of the living molecules are fairly clear — he mentions the matter, it is true, with a moderation which had the same cause as DESCARTES' repeated reservations " one must be absolutely free from all forms of prejudice ". BUFFON was the first biologist who tried to carry through a uniform explanation of nature in which all phenomena are considered as manifestations of the same physical laws.

Experience taught, however, that higher animals and human beings were not being produced out of clay. This difficulty was overcome by an idea fundamental to BUFFON's conception which he had evidently obtained from WOODWARD. Organisms are " moules intérieurs," absorbing the living molecules which circulate from body to body. In the earliest periods, when there was a large supply of free molecules, nature carried out on a large scale that which she now carries out on a small scale. Thus BUFFON seriously assumed, as did ST. AUGUSTINE and the mediaeval fantasts, a spontaneous generation of higher animals and man and he was the first and last who built up a scientific system on this concept. He was in certain cases inclined to assume a changeability and has therefore been considered a pioneer of the theory of descent. His general opinion was, however, incompatible with every idea

of evolution. According to him species are, once and for all, determined by their inner form, the first individual being the model on which the others are formed. His dependence on PLATO's doctrine of ideas and above all on ARISTOTLE's doctrine of form, is quite obvious.

THE PHILOSOPHY OF ENLIGHTENMENT

BUFFON exercised an enormous influence. DIDEROT, who was strongly influenced by him, suggested as did also at an earlier date MAUPERTUIS, a process of evolution, but this idea was not accepted by the other philosophers of enlightenment. LA METTRIE developed a line of thought which crudely echoes that of BUFFON but which also goes straight back to LUCRETIUS. The origin of animate beings through a combination of the mobile particles of matter was quite compatible with the doctrinaire opinion of HOLBACH who found confirmation in NEEDHAM's experiments on spontaneous generation.

The theory of spontaneous generation and the idea of special creation stood in opposition to each other, and the former had prospects of victory in philosophical circles. Then the idea of creation was given support by that thinker who more than anyone else undermined the dogmas of the church, VOLTAIRE. He rejected all ideas of spontaneous generation as a " sottise inouie." Deism was, in fact, the base of VOLTAIRE's philosophy and organic life was the chief argument for his deism. It is easy to explain that he was satisfied with a purely conventional concept of creation. Least of all was he a biologist and the question only interested him as a means in his defense of his philosophy.

In biology the new hypotheses of spontaneous generation propounded by BUFFON and NEEDHAM never acquired a real footing. They were severely attacked by SPALLANZANI. A still greater influence had, however, the work of LINNAEUS.

LINNÆUS

In LINNAEUS' concept of species there was an idealistic aspect derived from PLATO's doctrine of ideas. In his opinion, species

as well as families and " natural " higher categories were created. This concept, however, was not in complete harmony with his concept of species which at the same time was empirical. His sense of philosophical abstraction was, as a matter of fact, rather undeveloped. His idea of creation became, therefore, more consistent, when, in 1760, he assumed that only one species of every genus was created and that the remaining species were formed by crossing. Some years later he completed the step by suggesting that only one individual of each order was created. These remarkable ideas were, however, of no importance for subsequent research. His concept of the creation of the species was, on the contrary, of a very great importance.

There never was a biologist to whom the idea of spontaneous generation was more foreign than to LINNAEUS. It was opposed to one of his foremost biological principles, namely, to his conviction of the evolution of all living things from eggs or seeds, and it was opposed to his naive religious belief. He never doubted that a number of species unchangeable in themselves were created. Species formed by hybridization were looked upon as only the *one* original species dressed in garb borrowed from different male parents. The process of creation was for him a forming out of the clay of *entire* plants and animals, not seeds, nor eggs.

Through this concrete idea of creation LINNAEUS' conception of the species was genetic. All individuals of one species were descended from the original pair created in the beginning. The latter opinion was not based upon dogmatic principles but was supported by a mixture of logic and scientific evidence typical of LINNAEUS, which we cannot enter upon here.

The problem was thus solved for all biologists who were influenced by LINNAEUS. The argumentation was simple : the hypothesis of spontaneous generation was erroneous and in consequence a creation of species must be postulated.

ROMANTIC *Naturphilosophie*

There were, however, scientists who clearly discerned a third possibility, but their ideas had very little influence. LAMARCK's

doctrines met only with indifference. The theory of evolution had no chance to prosper; a new philosophy had arisen and given its impress to all branches of science.

Since ARISTOTLE no philosopher has exercised such a strong and direct influence upon biology as did SCHELLING. The ideas he put forward spread like wildfire. In this philosophy were to be found seeds which could have grown and to some extent did grow into an evolutionary concept. This was clearly expressed by TREVIRANUS, only indistinctly suggested by OKEN. But other tendencies prevailed according to which the origin of organisms was purely a metaphysical problem without connection with their concrete genesis. When plants and animals were derived from " the absolute identity " (SCHELLING), the question of their natural origin had hardly any further significance. HEGEL was the most consistent of all these metaphysicians, since for him " organic nature has no history."

CUVIER

For a long time CUVIER was reproached for having assumed a new creation after each of the disastrous cataclysms which he postulated. In later times it has, on the contrary, been maintained that he referred only to new faunas, which had immigrated from unknown regions. Both of these interpretations of his views are biassed and far too simplified. CUVIER expressed himself very cautiously, but he did not explain the appearance of *every* new fauna by his hypothesis of immigration. This hypothesis expressly had reference only to the recent fauna. He has unquestionably founded the theory, which was formerly only divined, concerning the successive appearance of organisms on the earth. However, he never mentioned repeated *creations*.

What did he think? It is quite certain that he never imagined that a supernatural miracle could solve a scientific problem. Between LINNAEUS and CUVIER there is a deeper chasm than that between the latter and DARWIN. Even less did he postulate a spontaneous generation of higher organisms. What possibility remained then? Obviously only one, i.e., the evolution of the higher organisms from the lower. CUVIER must have been

conversant with this thought and, on the whole, it is the only one he discusses. Moreover, he had not the slightest objection to the idea of descent in itself. He refuted it, but only on account of lack of evidence and on account of facts which he thought spoke against it. CUVIER, who has been judged so harshly on account of his dogmatic idea of creation, and who, during his last years adhered more and more obstinately to the unchangeability of the species, was in principle closer to the idea of evolution than was BUFFON, who has been praised as one of its pioneers. He was of a critical bent of mind and limited himself to such facts as he deemed incontestable : namely, on one hand, the constancy of the species, on the other, the successive origin of organisms. He refrained from the attempt to make a synthesis between these facts. Was it possible for him to shut his eyes to the conflict? What did he think in his innermost heart? Nobody knows.

THE DECADES BEFORE DARWIN. A GENERAL SURVEY

The situation in the decades previous to DARWIN has been judged quite differently. On the one hand it has been maintained that a great number of scientists embraced the belief in a common descent of organisms, and, on the other hand, that the doctrine of special creation was completely unshaken. Both views are incorrect. The pre-Darwinians had very little influence. Their views were based on unreliable ground, or at least on evidence too doubtful to enable them to attract any attention. But the idea of descent grew stronger and stronger in obscurity. An interesting symptom is that VON BAER entirely rejected the dogma of the unchangeability of species, although he only admitted a common descent to a limited extent.

Many still adhered to the naïve idea of special creation. The word " creation " still retained its power over thought and was able to hide the fact that the question of the origin of organisms, however answered, always has a scientific side. With those scientists who probed deeper and realized this fact, the power of the naïve idea of creation was, however, broken. For them there were three ways open, apart from that which led to the theory of evolution : (1) an agnostic conception resembling

CUVIER's, (2) the idea of spontaneous generation, and (3) the robing of the idea of creation in a philosophical garb which corresponded to the demands of the times. These views were forced to the fore according to the law of least resistance. Before DARWIN's time there seemed to be no satisfactory explanation which could replace them. The doctrine of creation was given a strong support due to CUVIER's authority, since it was not noticed that there was a difference between a refutation of the theory of evolution and a proclamation of the creation of the species. CUVIER's successors, particularly D'ORBIGNY, remodelled the theory of the successive appearance of organisms into a theory of successive mass-creation.

THE AGNOSTIC ATTITUDE

Many biologists who were influenced by the *Naturphilosophie* adopted a marked agnostic attitude. Nothing justifies us, declares JOHANNES MÜLLER (1833, 1844), to make conjectures as to the origin of organisms; this problem is outside the range of our knowledge. ALEXANDER VON HUMBOLDT rejected this question still more emphatically. His agnosticism made a bad impression on contemporary theologians. It aroused much indignation that God's name did not appear anywhere in the whole of his " Kosmos."

LYELL who, more than any other scientist, paved the way for DARWIN, was an empiricist who tried to explain everything as depending on unchangeable natural laws. He knew better than most of his contemporaries that organisms had arisen in succession during the evolution of the earth, but rejected both LAMARCK's hypothesis of evolution and the possibility of spontaneous generation. He expressed himself most decidedly against HUMBOLDT's view that the problem was outside the sphere of natural science. Yet he very carefully avoids the main point of the problem, viz., the process of the origin of organisms. The conflict must have been trying. There is no wonder that DARWIN's theory came as a relief to LYELL.

We meet a still more malignant conflict in the case of BRONN, the well-known paleontologist. He at first believed in a divine

creation, but some years later he declared that the sober scientist who knows that nature is a work of forces bound to matter, can neither accept anything like that, nor a spontaneous generation. " Und doch kennen wir kein Drittes ! " In desperation he thinks that there has existed " a natural force hitherto completely unknown to us. " The collapse of the dominant philosophies was evidently close at hand. BRONN in his old age was completely confused by DARWIN's theory.

HYPOTHESES OF SPONTANEOUS GENERATION

The old belief in a spontaneous generation of unicellular organisms and intestinal worms was rather common and lingered up to the middle of the 19th century. This belief makes it intelligible, to a certain extent, that some scientists could still imagine that the higher organisms, even man, which certainly are not now originating spontaneously, might have done so originally.

H. BURMEISTER, the zoologist, stated in a much read and very popular book (1843 and later editions), that the only possible solution of the question would be that all the organisms had been formed by spontaneous generation during several " periods of creation." Not without surprise do we come across the same thought expressed by one of the foremost biologists of that time, R. LEUCKART, who expressly stated (1853) that even the higher organisms had originated in this way, latest of all.

Here we find ourselves taken back a century, right down to BUFFON. In BURMEISTER we even find BUFFON's idea that the greater part of the original organic substance had perhaps been made use of in the earliest times. LEUCKART is more sober, but exhibits a similarity to the French naturalist in that he makes this idea possible to himself by placing the process at a time long since past. It seems inconsistent, however, that LEUCKART opposed the suppositions that spontaneous generation of the lower organisms still is going on. He argued in the following manner: at one time all organisms *must* have been formed by spontaneous generation; when the conditions for this generation ceased to exist, the whole process ended.

The conflict of the drama was truly acute; the solution could not be far away.

The Materialists

Darwinism and materialism were originally foreign to each other. In one of the foremost materialists of the day, C. Vogt, one comes across a view which is clearly anti-evolutionary (1847, 1851, 1855). He saw in the hypothesis of an ascending development an objectionable idea of *Naturphilosophie*. It sounds paradoxical that he fought against the theory of evolution on account of his opposition to the dogma of creation maintained by the Church. Since this dogma presupposed a common origin for the human races, he frantically denied both this and, in consequence, every form of changeability in the world of organisms. He rejected the theory of spontaneous generation as being a nightmare of *Naturphilosophie*. What remained? Nothing. Vogt ended in a form of agnosticism, whose incompatibility with his other views of life he did not notice.

Moleschott and Buchner postulated spontaneous generation. The latter imagined at the same time an evolution with sudden transformations. The most interesting of the materialists (among whom he may be reckoned only with a certain reservation) is H. Czolbe. He applied with ruthless consistency his principle that the system of the world is eternal, even as regards the organisms. They have never arisen, all species now living having always existed. No one was so foreign to reality, but neither was any one so consistent. Others went around the question by speculating on the eternal ideas of organisms; Czolbe came to the scientifically absurd but logically correct conclusion that the *material* organisms are eternal. In Darwin's theory he saw afterwards only unscientific theology.

The Idealistic Morphology

The system of *Naturphilosophie* which had no roots in empirical research, and had therefore been dissolved in romantic fog, still lived in biology during the decades before Darwin in the form of an idealistic morphology. A fundamental principle of this philosophy is that living nature is a manifestation of an ideal

plan or a plan of creation. The line of demarkation between these concepts was quite indistinct.

The most characteristic feature in this doctrine has its origin not as is often supposed in religious ideas, but in those of natural science. The idea of one or more plans for the construction of organisms is in reality as old as biological research, nay, older; it has existed as long as the head, the extremities, the heart, etc., in different vertebrates and as the leaves of different plants, have been regarded as the same organ in different forms. It gained its great importance for science in BUFFON. It was of great significance that HERDER based his philosophic system on this thought. GOETHE was entirely fascinated by the idea of the prototype. With blind consistency it was carried through by GEOFFROY ST. HILAIRE in the second and third decades of the 19th century. In opposition to his theory of unity of type, CUVIER placed his famous doctrine of the four types. The great empiricist expressed by this theory only what to him seemed to be an absolute fact. He wished only to emphasize that certain animals possessed a likeness as great *as if* they had been formed according to a common plan. (1)

For these men, so different from each other, the concept of a plan or type signified everything, the idea of a creation nothing, or next to nothing BUFFON postulated a mechanical spontaneous generation. GEOFFROY ST. HILAIRE saw the solution in the theory of evolution. GOETHE sought an ideal prototype. CUVIER said nothing. And yet, although CUVIER avoided mentioning the word creation so skillfully that no one noticed its absence, his concept became the basis for the transformation of the plan of construction into a plan of creation.

The idealistic morphology was historically a necessity. Its ideas fascinated more or less nearly all scientists. To VON BAER all living beings were words and syllables, in which a single fundamental thought is expressed, embodiments of the idea of creation. With LEUCKART, the empiricist, and J. MÜLLER, the vitalist, VOGT, the materialist, and MILNE-EDWARDS, we come across similar fundamental views. Among the botanists may be

(1) See the Author's essay " From Cuvier to Darwin " in this journal, Vol 24, p. 361-6.

mentioned A. DE CANDOLLE, HEER, UNGER, and ELIAS FRIES. At an early date the latter's idealistic conception embodied evolutionary ideas. With UNGER, as with WALLACE, the concept of an evolution of ideas was almost imperceptibly changed into a concept of descent.

The idealistic morphology reached its culmination and at the same time its end with OWEN and AGASSIZ. R. OWEN bases his concept of existence on the Platonic system. His archetype of the vertebrate was a creation entirely in the spirit of GOETHE and OKEN. It is an ideal model formed by Divine Reason (1846, 1848, etc.). He felt, however, a necessity of trying to understand the forces which had been active at the realization of the prototype, and then glides over from the general idealism of the *Naturphilosophie* to a seemingly natural scientific speculation on a vitalistic basis, in which the power of the *Naturphilosophie* is, in reality, still equally strong. He himself formulated the question of the "secondary" causes of progress in organic nature, but got no further than to the question. It is evident with OWEN, as to a certain extent also with VON BAER, that at that time the idealistic morphology had reached a point where an inner conflict and dissolution foreboded its approaching inevitable destruction.

With LOUIS AGASSIZ (1859 and earlier) there was no hesitation, no conflict, no unanswered questions, nothing that pointed forward. He does not start from morphological but from systematic points of view. From ideas, which had been dimly seen by many, he went the whole length and saw in all the categories of the system realizations which possess eternal existence; if we knew of all of the Crustacea only the common crayfish, we could, however, distinguish in it between the characters of species, genus, family, and order. Everything is the manifestation of a divine plan of creation, independent of the external world and unchangeable. Numerous individuals of all organisms, even man, were created at the same time where they now live. Progress can be discerned because, in his idea of creation, the Supreme Being has progressed from the general to the particular; the plan is completed in man. AGASSIZ' doctrine did not conform very well to the orthodox idea of creation, but soon became the best support available for this belief. One had, in some way or other, to

submit to the fact that Adam and Eve and many other things had been lost during the rambles in the jungle of *Naturphilosophie*.

Even the most consistent idealistic system of thought does not free us from the obligation of seeking scientific explanations of material phenomena. This truth which now seems evident, or ought to be so, has not always been recognized. PLATO's doctrine of ideas led, as we have seen, to a denial of the necessity of every scientific explanation. There was the same tendency in the romantic *Naturphilosophie*. AGASSIZ, who was not the most original but the most desperately consistent of the idealistic morphologists, never felt (contrary, for example, to OWEN) a need of, nor a temptation to seek scientific causes of the origin of organisms. From this position there was no return, and no negotiations with opponents were possible. When Darwinism forced its way to the fore, AGASSIZ had destroyed all bridges, and finally he stood practically alone on the rampart.

DARWIN's theory, which was through and through naturalistic and had not the slightest room for thoughts of an ideal plan, was a hard blow to all who had grown accustomed to another world of thought. It was, as a matter of fact, from the idealistic morphology that the most serious opposition was raised against DARWIN's theory. But this does not belong to the subject of this paper.

Uppsala. N. VON HOFSTEN.

Animals impregnated by the wind [1]

When CAMERARIUS first published the evidences of sexuality in the flowering plants, he was faced with the necessity of proving that wind could carry pollen from one flower to another. In the course of his presentation he cited several classical examples of the fertilizing power of air, and even quoted a passage in VIRGIL's *Georgics* which tells how certain mares were impregnated by the west wind. He thus called attention to a very ancient fantasy. In his famous letter to VALENTINE, *De Sexu Plantarum Epistola*, Tübingen, 1694, he referred to these mares and to the " wind-eggs " of several species of birds :

" Those unfertile eggs of birds produced without the influence of the male are generally called wind-eggs because, as ARISTOTLE explains, in springtime the birds seem to receive a fertilizing breath from the west wind. VIRGIL also refers to this when he describes the excited condition of the mares : ...

" These words can be applied better to the conception of plants than to that of animals, for the latter, although they may be moved and stimulated by the wind, receive no germ from it, but plants owe much more to the wind because in the spring, their organs of conception are directed to the Zephyr like so many nostrils to inhale the rustling airs and the flower dust. Impregnated by the wind's breath, (oh wonder to relate) they conceive without copulation. Also the egg that is impregnated here in the plant through the medium of the wind or the air, the carrier of the male principle is fertile and not a wind egg. PLINY also commends the power of Favonius (the west wind)... That must now certainly be interpreted with a grain of judgment, for apart from the old fable about the wind-impregnated Spanish mares, how can such a fruit be other than a sterile thing, a wind egg, a misbirth."

Strangely enough most classical and medieval philosophers believed that certain mammals and birds could be impregnated by wind, although they were ignorant of the wind's function in the cross-pollination of the flowering plants. This belief in the existence of what we might call anaemophilous animals is

(1) This investigation was aided by a University of Pennsylvania Faculty Research Grant.

extremely ancient. From the earliest times it existed in Egypt, Greece and the Orient and ultimately it became a part of the intellectual heritage of many races. It spread along the sea routes of the whole eastern hemisphere, and it has been found from Portugal to Japan, and in all of the countries between. Our first record of this belief comes from the *Iliad*, our last from the folklore of the Ainu; between these extremes are records by Greek philosophers, Roman naturalists and early Christian saints. Medieval schoolmen copied the classical accounts while Arab travellers, Chinese geographers and modern anthropologists have reported numerous instances of the existence of this belief. Indeed few scientific errors have had such an honorable history.

Four types of females were the chief recipients of the winds' attentions; they were mares, vultures, hens and women. This makes it possible for us to arrange the stories into four classes, each concerned with one of the four subjects. Surprisingly enough, when the stories are thus grouped they do not seem to be mere variants of some one primitive legend, but rather four separate tales, each with its own origin but each influenced by the others in the course of its development. The reason why the wind was chosen as the fecundating agent in all four cases is not at all clear. It will probably have to be sought in some psychological twist of the not quite civilized folk among whom the stories originated.

To the best of my knowledge the descriptions of anaemophily in the animal kingdom have never been collected or made available to modern students of parthenogenesis. Perhaps too much of the history of science is concerned with the origin and development of ideas which we now view as sound, yet any true picture of the intellectual equipment of our predecessors must include, of course, their errors as well as their occasional lapses into accuracy. Few subjects can illustrate the scientific standards of the credulous ages as well as these stories of the wind-impregnation of animals.

Fortunately, the numerous passages which describe this fecundation are not too long to quote, for many of them are in works not easily obtained. As each illustrates some stage in the development of the legend, or some practical use to which the legend was put, they are given here in full. The passages are arranged chronologically in four sections, each section dealing

with one of the objects of the wind's attention. Needless to say the following pages do not include all such records.

Mares

No one reading of the amours of Zephyrus and Boreas in the *Iliad* would have cause to suspect that their philanderings had a place in the history of science. In Book XVI (translated by ANDREW LANG) occurs the passage,

"And for him Automedon led beneath the yoke the swift horses, Xanthos and Balios, that fly as swift as the winds, the horses that the Harpy Podage bare to the West Wind, as she grazed on the meadow by the stream Okeanos."

From Book XX (translated by ERNEST MYERS)—

"Three thousand mares had he that pastured along the marsh meadow, rejoicing in their tender foals. Of them was Boreas enamoured as they grazed, and in semblance of a dark-maned horse he covered them: then they having concieved bare twelve fillies."

There is nothing in these passages about the fertilizing power of the unpersonified wind but during the next five hundred years the legend became full grown and we find it in the *Historia Animalium* of ARISTOTLE.

From Bk. VI; 18 p. 572a (translated by THOMPSON)—

"The mare is said also about this time to get wind-impregnated if not impregnated by the stallion, and for this reason in Crete they never remove the stallion from the mares; for when the mare gets into this condition she runs away from all other horses. The mares under these circumstances fly invariably either northwards or southwards, and never towards either east or west. When this complaint is on them they allow no one to approach, until either they are exhausted with fatigue or have reached the sea. Under either of these circumstances they discharge a certain substance called "hippomanes," the title given to a growth on a new-born foal; this resembles the sow-virus, and is in great request amongst women who deal in drugs and potions."

When VARRO (118-30 B.C.) related the story he shifted the scene of the impregnation from Crete to Spain. This may seem to be a strange move to us, for in classical times the Cretans were reputed to be the greatest of liars. In *De re rustica* (II; 1), however, VARRO apparently did not need a Cretan alibi.

"Speaking of pregnancy, let me tell you some thing which happens in Spain;

no one will believe it, but it is none the less true. In Lusitania, near the ocean, in that stretch of country where is the town Olisipo, certain mares on Mount Tagrus conceive at a certain time of the year by means of the wind, just as hens frequently do with us, the eggs of which we call ' wind eggs.' The foals, however, born of these mares do not live longer than three years."

By far the most famous description of these mares is in the *Georgics* composed by VIRGIL in 31 B.C.

From Bk. III, 273 (tr. by OGWAN)—

" Most strongly marked of all, apparently, is the passion of the mares; even reason did their mere passion lend them, when his Potnian team tore piecemeal with their teeth the limbs of Glaucus. Love guides them over Gargarus, and across the loud Ascanius; they climb the mountains and swim the torrent. At first, when flame kindles in their longing vitals—in spring especially; for then the heat revives along their bones,—facing the western breeze, all stand on the tall cliffs, and breathe the gentle wind; and often, without copulation—strange to tell—impregnated by the wind, they disperse among the rocks and headlands, and deep valleys; not toward thy region, Eurus, or the sun-rise, but toward Boreas, and Caurus, or where darkest Auster rises, and blots the heaven with a chilly damp. Then, at this particular season, flows the hippomanes—so shepherds truly call it—which jealous step-dames often gather to medicate their herbs and deadly charms."

In the version by COLUMELLA (30-40 A.D.) the lascivious thought of the mares aids the wind in the accomplishment of its purpose. From Bk. VI. Ch. 27. (Translated by M. C. CURTIUS)—

" Nor is there any doubt, but, in some countries, the mares are inflamed with such a strong and ardent desire of coition, that, altho' they have not the male, yet, by their continual and excessive desire, raising in themselves the imagination of venery, they (in the manner of fowls constantly kept in a barren) conceive with the wind; which things the poet expresses with greater license...

" Forasmuch as it is a thing also very well known, that on the Sacred Mountain in Spain, which extends itself toward the west, hard by the ocean, mares have frequently been pregnant without coition, and have brought up their offspring: which nevertheless is of no use, because it is snatched away by death when three years old, before it comes to maturity.

" Wherefore, as I have said, we must take care, that mares be not tormented with their natural desires, about the time of the vernal Aequinox."

Shortly after COLUMELLA wrote his *Res rustica*, PLINY's famous *Natural history* appeared (77 A.D.). The story of the mares is not one that PLINY would miss. The translation here quoted was made by HOLLAND and published in 1601. From Pt. I, Bk. 8, p. 222—

" In Portugal, along the river Tagus, and about Lisbon, certaine it is, that

when the West wind bloweth, the mares set up their tails, and turne them full against it, and so conceive that genitall aire insteed of the naturall seed: in such sort, as they become great withall, and quicken in their time, and bring foorth foles as swift as the wind, but they live not above three years."

SILIUS ITALICUS (25-101 A.D.) was contemporary with PLINY. In his poem, *Punica*, he referred twice to these wind-begotten horses. He allowed them seven years of life.

From Bk. III, lines 378-383—

"And Balarus tests the wings over the open surface of the land of the Vettones. Indeed here when the spring is mild and the breeze is temperate, the herd of horses makes its race sure by observing secret copulations, and with the fruitful breeze conceives a hidden love. But the span of life of the race is not great, and old age comes fast; and seven years is the longest time that the herd spends in these stables."

The following reference is to a race horse, and is reminiscent of HOMER. From Bk. XV, lines 362-366—

"But on the inside of the left track he would just graze the turning post, distinguished by his great neck and also by many sportings of his mane over his neck; his mother (Harpe) bore him in the presence of the fresh blasts of the West Winds in the fields of the Vettones."

About the year 200 A.D., AELIAN wrote *De natura animalium*. He did not mention the legend of the mares of Spain but his description of the begetting of sheep shows the influence of the story. From Bk. II, Ch. 46—

"Indeed sheep are not ignorant of this, that the north wind and the south wind accomplish their fertilization no less than the rams entering into them; and moreover they know that the north wind is effective in the generation of male offspring (2) and the south wind in the generation of female offspring; wherefore, that sheep which is involved turns herself toward one or the other

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(2) The belief that the direction of the wind at the time of copulation determined the sex of lambs was widespread. It is recorded by ARISTOTLE, *Historia Animalium*, Bk. VI, Ch. 19; PLINY, *Historia Naturalis*, Bk. VIII, Ch. 72; ANTIGONUS, *Historia Mirabilium*, Ch. CXI; COLUMELLA, *De Re Rustica*, Bk. VII, Ch. 3; ALBERTUS MAGNUS, *De Animal.* Tract. III, Bk. 6, Ch. 2; etc. A Middle English translation of PALLADIUS' *De Re Rustica* expresses the belief rather quaintly. Bk. VIII, Lines 95-99 —

"And toward that wynd yf the tuppis ofre,
With litel malis fillith they the cofre,
And toward southwynd getith they femalis,
Yf hit be sooth, right notabul this tale is."

according to which sex is desired... But sheep easily and without any ceremonies, have the winds assistance in their conception, spontaneously with neither entreaty nor boldness. Even the shepherds are observers of this practice, for when the south wind blows, since the number of female offspring is thereby increased, they let loose the rams among the sheep."

CAIUS JULIUS SOLINUS, who lived toward the latter end of the third century, repeated the story of the mares in his famous work which was later known as the *Polyhistor seu de mirabilibus mundi*. His version reads—

" In the neighborhood of Olissippo the mares indulge in sexual play and bear issue with marvelous fertility, for when the west wind blows upon them they conceive, and they, when they are athirst for males, are married by the breath of the breezes."

At about the time of SOLINUS or perhaps a little later, LACTANTIUS (264-340 A.D.) found a practical application for the story. LACTANTIUS was a respected Christian writer who influenced greatly the formation of the doctrine of the early Church although he was never raised to the rank of a real authority. He attempted to make the virgin birth of Christ more plausible to the Pagans by reminding them of one of their own beliefs, i.e., the parthenogenesis of certain foals. It is true that this was not the first use that was made of such an argument, as many years earlier ORIGEN and CLEMENT had cited the popular belief concerning vultures and hens in their defense of their theological concep tions. From LACTANTIUS' account—

" Chap. XII. *Of the birth of Jesus from the Virgin; of his life, death and resurrection, and testimonies of the prophets respecting these things.*

" Therefore the Holy Spirit of God, descending from heaven, chose the holy Virgin, that He might enter into her womb. But she, being filled by the possession of the Divine Spirit, conceived; and without any intercourse with a man, her virgin womb was suddenly impregnated. But if it is known to all that certain animals are accustomed to conceive by the wind and the breeze, why should anyone think it wonderful when we say that a virgin was made fruitful by the Spirit of God, to whom whatever He may wish is easy? And this might have appeared incredible, had not the prophets many ages previously foretold its occurrence."

Nearly a hundred years after LACTANTIUS, CLAUDIANUS (397 A.D.) referred to the wind impregnation of the tigress. This passage is evidently but a poetic variation of the same general

theme (3). From the *Rape of Proserpine*, Bk. III, line 265—

"Speedier than the West Wind that is her paramour, rushes the tigress, anger blazing from her stripes, but just as she is about to engulf the terrified hunter in her rapacious maw, she is checked by the mirrored image of her own form."

JUSTIN, a contemporary of CLAUDIANUS, introduced the first note of real skepticism into the story. He even went so far as to term it a fable. From his *History of the World*, Bk. 44, Ch. 3—

"Several Authors have affirmed that in *Lusitania*, near the Banks of the River Tagus, the Mares conceive by the wind. What gave occasion to this fable, is the great Fecundity of the Mares; and the vast Numbers of Horses that are to be seen in *Gallicia* and *Lusitania*, where the Jennets are so prodigiously Swift, that 'tis not without some Reason they are said to be begotten by the Wind."

JUSTIN'S doubts did not extend to ST. AUGUSTINE. Indeed the Bishop of Hippo was anything but a skeptic. The following extract from *De Civitate Dei* (413-426 A.D.) illustrates perfectly the intellectual standards which made the Middle Ages possible. Needless to say the books of ST. AUGUSTINE influenced profoundly the development of medieval Christianity. From Bk. XXI, Ch. 5—

"Chap. 5.—*That there are many things which reason cannot account for, and which are nevertheless true.*

"Nevertheless, when we declare the miracles which God hath wrought, or will yet work, and which we cannot bring under the very eyes of men, skeptics keep demanding that we shall explain these marvels to reason. And because we cannot do so, inasmuch as they are above human comprehension, they suppose we are speaking falsely. These persons themselves therefore, ought to account for all these marvels which we either can or do see. And if they perceive that this is impossible for man to do, they should acknowledge that it cannot be concluded that a thing has not been or shall not be because it cannot be reconciled to reason, since there are things now in existence of which the same is true. I will not, then, detail the multitude of marvels which are related in books, and which refer not to things that happened once and passed away, but that are permanent, in certain places where, if any one has the desire and opportunity, he may ascertain truth; but few only I recount. The following are some of the

(3) More than two centuries before CLAUDIANUS, OPPIAN denied this story. From *Cynegetica* III : 355 (tr. by MAIR) written in the last half of the second century :—"Tiger, swifter is it than all wild beasts that are : for it runs with the speed of its sire, the West wind himself, yet the West Wind is not its sire; who would believe that wild beasts mated with an airy Bridegroom? For that also is an empty tale, that all of this tribe is female and mates not with a male :..."

marvels men tell us :—The salt of Agrigentum in Sicily, when thrown into the fire, becomes fluid as if it were in water, but in the water it crackles as if it were in the fire. The Garamantae have a fountain so cold by day that no one can drink it, so hot by night no one can touch it.

" In Epirus, too, there is a fountain which, like all others, quenches lighted torches, but, unlike all others, lights quenched torches. There is a stone found in Arcadia, and called asbestos, because once lit it cannot be put out. The wood of a certain kind of Egyptian fig-tree sinks in water, and does not float like other wood; and, stranger still, when it has been sunk to the bottom for some time, it rises again to the surface, though nature requires that when soaked in water it should be heavier than ever. Then there are the apples of Sodom, which grow indeed to an appearance of ripeness, but, when you touch them with hand or tooth, the peel cracks, and they crumble into dust and ashes. The Persian stone pyrites burns the hand when it is tightly held in it, and so gets its name from fire. In Persia, too, there is found another stone called selenite, because its interior brilliancy waxes and wanes with the moon. Then in Cappadocia the mares are impregnated by the wind, and their foals live only three years. Tilon, an Indian island, has this advantage over all other lands, that no tree which grows in it ever loses its foliage.

" These and numberless other marvels..."

Certainly any belief endorsed by such a galaxy of authorities as ARISTOTLE, VIRGIL, PLINY and ST. AUGUSTINE would not lapse during the Middle Ages. Shortly before the year 1200, ALEXANDER NECKAM, whose mother was the wet-nurse of RICHARD CŒUR-DE-LION, wrote *De naturis rerum*. This book, which contains the earliest European mention of the magnetic compass, also tells of the mares.

" They say that the female horse whose opportunity with a male is lacking conceives by the snorting blast of the North Wind, but its offspring will live only a few days. And so the hen when it takes its bath with frequent flutterings and with applications of dust, may lay soft eggs without coition, but does not obtain the joy of offspring. The eggs, however, are called soft as if they were without a skin, and whenever they are such that they may be supped up they receive this name. Those especially, however, are called soft which are found in the belly of hens and are without an outer skin."

WALTER OF METZ included the story of the mares and the wind in his *L'image du monde* written in 1246. This was one of the first books ever to be printed in English as it was translated by WILLIAM CAXTON himself who issued an edition in 1480. From CAXTON's translation —

" Ther is a maner of Mares that conceyve of the wynde, and ben in a contre that is named Capadoce; but they endure not but iii yere."

Just twenty-two years after WALTER OF METZ wrote *L'image*

du Monde, ROGER BACON (1268) completed his *Opus Majus*. Here the story of the mares is related to a rather vague allusion to the wind pollination of the dioecious date-palm.

"The human mind can be influenced to accept the truth of the virgin birth, because certain animals remaining in a state of virginity conceive and bear young, as, for example, vultures and apes, as AMBROSE states in the Hexaemeron. Moreover, mares in many regions conceive by virtue of the winds alone, when they desire the male, as PLINY states in the fifth book of the Natural History, and SOLINUS tells us in his book on the Wonders of the World. ARISTOTLE maintains in the second book on Vegetation that the fruits of the female palms mature from an odor coming from the male trees."

NICOLAUS PEROTTUS (1430-1480), Archbishop of Siponto, included the story in his *Cornucopia*. From page 411 of the edition of 1521 :—

"... They say that in Lusitania by the river Tagus, the mares conceive foetuses by the wind, facing it when Favonius is blowing, and offspring is born through that (nicissimus), but it does not live more than three years. I believe that this fable has arisen because of the fertility of the horses and the immense size of the herd, for they are very abundant in Lusitania and are observed to be so fleet that the wind itself seems not unworthy to share in their conception."

Shortly after PEROTTUS, JOHANNES RAVISIUS TEXTORUS wrote *Epitheta*, Parrhisiis, 1519. He also repeated the story of the mares. (From p. 141b, edition of 1524)—

"... It is known that when the females assemble they are mostly seized with such a great ardor that if they do not have a male they imagine a lover for themselves and in too great a love desire, they conceive by the wind. For VARRO says that in further Spain in the spring time, the horses, incited by too much heat, throw open their mouths against the cooler airs and winds to relieve their heat; and thereafter they conceive and bring forth young, but these are not allowed much time for their surpassing fleetness. For before they reach their third year they are removed by death."

In 1570, HERESBACH published his *Res rustica*. This was translated in 1586 by BARNABY GOOGE as *Four Books of Husbandrie*. The story of the mares occurs on page 117b :

"..., neither is to be doubted, but that the mares in some Countries so burne with luste, as though they have not the horse, with their oune fervent desyre they conceave and bring forth after the manner of Byrdes, as the Poet noteth.

"*In furious lust the Mare exceeds all other beasts that be.* It hath been said that in Spaine Mares have conceaved with the winde, and brought up their Colts, but the Colts have not lived above three yeeres."

At last, in the seventeenth century, real doubt was felt as to the ability of the wind to replace the male. JOHANNES JOHNSTON referred to the matter very briefly in *Thaumatographia Naturalis*, Amsterdam, 1632. The English edition of this work appeared in 1657 as *An History of the Wonderful Things of Nature*, translated by " A Person of Quality." From page 218—

" In *Portugal* they say, the mares conceived by the wind, VARRO, PLINY and SOLINUS affirm, that the Birth is fruitless, for their Colts live not above 3 yeares. JUSTINUS calls these things fables."

Just three years after JOHNSTON's *Thaumatographia*, the *Historia Naturae* of JOANNIS E. NIEREMBERG appeared. NIEREMBERG seems to have been imbued with the scientific spirit and he undertook to investigate the legend. From Bk. I, Ch. 66, p. 410a (edition of 1675)—

" ... But no slight trace of this thing of former times, that is of unmarried fertility, now appears in those things which RESENDIUS (4) thus describes. But although I have refused to dispute on my own account about wind conception, yet I will relate what has been called to my attention as I was seeking earnestly into the credit of this questionable matter. I visited, seven years ago, a farmer of Benevento beside the Tagus, and when I asked him if he knew anything about conception of this sort or remembered having heard anything from others; he answered that neither he nor his neighbors who had had to do with horses had ever worried about it; merely that as they noticed that the females were in heat, they put them to the males to cure them; however, since he had a pretty horse and wished to have her very saleable at the next markets, before she started neighing he shut her up alone on the Island in the middle of the Tagus to fatten her with abundant food. After two months he discovered her pregnant and was astounded because no stallion had ever had access to her. He awaited the result. After seven months she gave birth, not to an animal indeed but to an unformed mass of bloody concretion which he thought to be an abortion. There is nothing new to me in this generation of horses. So much for RESENDIUS, LUDOVICUS CARRION and EDUARDUS WETONUS believe the ancient story to be true. It is possible because nature is often wont to be changed; and because it is not true to-day is no real proof that it was not so yesterday."

Vultures

In the *Glossary of Greek Birds*, Oxford, 1895, W. D. THOMPSON stated (p. 48) that the legend of the vulture's being impregnated by the east wind came from Egypt, where the bird was associated with Maut, the goddess of maternity. This would indicate that

(4) GARCIA DE RESENDE (1470-1536), a Portuguese poet.

the legend is very old, perhaps older than the story of the mares being fertilized by the west wind. The classical records are not as ancient, however, and the earliest of these do not show the myth in its fully developed form. ARISTOTLE described the production of vultures in *De Mirabilibus* but his account is notable for its description of degeneration in the animal kingdom rather than for its statements concerning vultures. He evidently felt that the vulture was no ordinary bird but eagles and hawks seemed to him just as exceptional. If the beliefs recorded by ARISTOTLE were held at all generally, it is obvious that the ground was well prepared for the spread of the Egyptian legend. From 831a, 1, (tr. by DOWDALL)—

"Of the offspring of a pair of eagles, so long as they pair together, every second one is a sea eagle. Now from the sea eagle springs an osprey, and from these spring black eagles and vultures: yet, on the other hand, these do not bring the breed of vultures to a close, but produce the great vultures, and these are barren. And a proof is this; That no one has ever seen the nest of a great vulture."

If no one could find the nest of the vultures the question naturally arose,—How could they breed? PLINY (Bk. X, Ch. 6) recorded this problem three hundred years later.

"The black Vultures are the best of that kind. No man ever could meet their nest; whereupon some have thought (but untruly) that they fly unto us out of another world, even from the Antipodes, who are opposite unto us."

PLUTARCH (46?-125? A.D.) referred directly to the Egyptian tale in the *Quaestiones Romanae*. He seemed to be very skeptical, yet he could not help revealing the fact that he really desired to believe the story. In Question 93 he discussed auguries. Now, if the victory or defeat of a Roman army depended upon a correct prognostication by the augurs, it is obvious that reliable birds were of the utmost importance. PLUTARCH stated the case for the vultures. At this time the legend was fully grown and in this form it remained for the next twelve hundred years. From Bk. II, Ch. 46 (tr. by CHAUNCEY)—

"Concerning Vultures.

"... They say indeed that male vultures are never found, indeed, all are female; for which reason these winged female creatures, not ignorant, and fearing scarcity of offspring contrive to beget offspring in this way: they fly before the South wind: if perhaps the South wind is not blowing, they spread themselves toward the East wind by opening the mouth and after three years they give birth. They

refuse to shelter any vultures in the nest; indeed I hear that *Aegypios*, which are half way between vultures and eagles, and are male and black in color, are discovered in their nests. I understand that vultures do not even hatch out eggs, but produce offspring which are winged instantly at birth; all of this I have heard."

In 248 A.D., the story got into patristic literature as an aid to the dogma of the virgin birth of Christ. No less an authority than ORIGEN used it in his refutation of the errors of CELSOS. From I : 37—

" ... But as a further answer to the Greeks, who do not believe in the birth of Jesus from a virgin, we have to say that the creator has shown, by the generation of several kinds of animals, that what He has done in the instance of one animal, He could do, if it pleased Him, in that of others, and also of man himself. For it is ascertained that there is a certain female animal which has no intercourse with the male (as writers on animals say is the case with vultures), and that this animal, without sexual intercourse, preserves the succession of race. What incredibility, therefore, is there in supposing that, if God wished to send a divine teacher to the human race, He caused Him to be born in some manner different from the common! Nay, according to the Greeks themselves, all men were not born of a man and woman."

The great Christian historian, EUSEBIOS (260-340 A.D.) described the belief in the *Praeparationes evangelicae* written shortly before 318 A.D. From Bk. III, ch. 12—

" Finally they describe the third celebrity in the town in the devout veneration of Diana whose effigy is like a female vulture in flight, to whom are adjusted wings constructed from selected and choice gems. And they show that the winds have power from Diana of creating and producing by this image of a vulture, but vultures which they assume to be all female are thought to conceive from the wind."

HORAPOLLON NILOUS, who lived in the fourth century, pretended to interpret the heiroglyphics on the Egyptian monuments. The following is his rendition of the vulture character.

" To denote a *mother*... they delineate a VULTURE. They signify by it a *mother*, because in this race of creatures there is no male. They are produced, however, in this way. The vulture is kindled with a desire to conceive, opening her womb to the North Wind, she is, as it were embraced by him for five days, during which time she partakes neither of food nor drink, being intent upon procreation. There are also other kinds of birds which conceive by the wind, but their eggs are of use only for food and not for procreation, but the eggs of the vultures that are impregnated by the wind possess a vital principle."

AMMIANUS MARCELLINUS, the historian, referred casually to

the lack of male vultures, in *Res gestae*, a work completed probably in 378 A.D. From Bk. 17—

"Meanwhile there may be an example of the knowledge of this fact in these two things, they disclose the nature of birth through the vulture : for the reports of natural science mention that no male can be found among these birds. And they show the Queen bee among the species of bees which produce honey."

The story of the vultures got back into patristic literature with ST. BASIL the Great who wrote *The Hexaemeron*, nine sermons on the Creation as described in Genesis. The exact date of this work is not known, but it was probably written sometime between 330 and 379 A.D. From Homily VIII, Sec. 6—

"Many birds have no need of union with males to conceive. But their eggs are unfruitful, except those of vultures, who more often, it is said, being forth without coupling and this although they have a very long life, which often reaches its hundredth year. Note and retain, I pray you, this point in the history of birds; and if ever you see any one laugh at our mystery, as if it were impossible and contrary to nature that a virgin should become a mother without losing the purity of her virginity, bethink you that He who would save the faithful by the foolishness of preaching, has given us beforehand in nature a thousand reasons for believing in the marvellous."

ST. AMBROSE of Milan (334-397 A.D.) wrote his *Hexaemeron* at about the time that ST. BASIL was writing. Like ST. BASIL he mentioned the vultures only as evidence of the reasonableness of the virgin birth of Christ. From V : 20—

"We have spoken about the widowhood of birds and that virtue arose from them first; now let us speak of chastity which also is proved definitely to dwell in many birds, that can be perceived in vultures. Indeed vultures are denied to indulge in coition, and conjugals by a certain practice and nuptial bonds engaged in by chance, and thus without any mate they conceive by seed and generate without conjuction, and the offsprings of these because of their longevity reach a great age so that up to a hundred years of life a succession of them is produced, and they do not die easily of needy old age. What say those who are accustomed to smile at our mysteries when they hear that a virgin may generate and do they esteem impossible bearing by an unmarried girl whose modesty no custom of man violates? Is that thing thought impossible in the Mother of God which is not denied to be possible in vultures? A bird bears without a mate and none confutes it, and because Mary bore when betrothed they question her chastity. Do we not perceive that the Lord sent beforehand many examples from nature itself by which incarnations he proved the virtue of the suspected one and added truth (to the story)."

In the last half of the sixth century, CASSIANOS BASSOS mentions

the wind-impregnation of vultures in his *Geoponica* (Bk. XIV, Ch. 26).

Concerning Vultures. ARISTOTLE.

ARISTOTLE relates that vultures are destroyed by the odor of unguents just as beetles are by the odor of roses. For a rank odor is good for their health. Moreover vultures do not unite sexually but fly headed into the South Wind and thus become pregnant, and after three years they produce young.

ST. ISIDORE OF SEVILLE (560-636 A.D.) in his *Etymologiae sive Origines*, cited the wind-impregnation of vultures merely as a natural curiosity. This work was written between the years 622 and 633. From Bk. XII, Ch. VII, 12-13—

" ... The vulture is thought to be famous for slow flying; certainly because of the greatness of its body it does not have a quick flight. They say that some of them do not mingle in coition, and conceive and generate without copulation; and offspring born of these live almost a hundred years. And vultures, just as eagles, perceive dead bodies beyond the seas; truly flying so high they see from above many things which are hidden in the obscurity of mountains."

A contemporary of ST. ISIDORE, THEOPHYLACTOS SIMOCATTES, who lived at the other end of the Mediterranean Sea, wrote a book on natural curiosities about 629 A.D. According to THEOPHYLACTOS vultures would copulate at certain times and the women of Lemnos knew how to receive sailors. The following extract is from his *Dialogos*, Chapter 8—

" Antisthenes—

" Many genera among birds do not have need of males in copulation for conception. But others, indeed, which are full of wind do not bear. Vultures, however, have such a nature that they may bear without conjunction with males. Accordingly a male vulture is generally not to be seen, for the nature of the female cuts off the whole sex from them. But at times, when vultures fear the loss of their children, the whole race devoted itself to copulation, just as the Lemnos women of old seeing the fleet land. From thence vultures combine many kinds of cunning. They fly about against the south wind. But if there is no south wind, to the neighboring southeast wind they expand their wings. Then they open and thus become filled with the inflowing wind; and they give birth not to wind-eggs but to living young. Therefore many times it is necessary for nature to complete the animal, Polycrates."

During the next five hundred years the legend of the vultures naturally underwent some changes. These are shown clearly in the *Historiarium variorum chiliades* of JOHN TZETZES, a Byzantine writer born in 1110 A.D. From Chap. XII—

"Some people, without investigation, say that vultures produce living things and that they have both milk and breasts and other such things. As I have found that tigers are all male so also I have found that the entire tribe of vultures are female. And flying for five days with the wind against their rumps, they receive properly the gonad from the wind. In 120 days they produce the wind eggs and in as many days they hatch out (the young) from the eggs and in another 120 days they rear them up to the time of their flight. You have the fertilization of the vultures, that is to say of the female generations, by the wind."

The *Annales* of MICHAEL GLYCAS appeared sometime between the years 1143 and 1156. From Pt. I, p. 42 (pp. 81-82, ed. of 1836)

"Now they say, among other things which differ even more from the beliefs of men, that vultures produce young without the union of male and female, even at an extreme age for they live to be a hundred years old. Why this? Doubtless to prevent them (unbelievers) from mocking at our secret rite, just as if it were impossible for a virgin to bear young and remain none the less a virgin. From this birth God merely provided us with complete explanations for building our faith in things otherwise absurd and contrary to our beliefs. Thus BASIL discusses these matters. Others, indeed, who have seen animal births, say that vultures carry the foetus unnaturally for fully three years. Why this? Listen! No male vulture is seen. Then without the union of two, they are accustomed to produce according to the regulations of nature. As a result the complete breeding of vultures exists in the females. Since they are not ignorant of this, in dread of barrenness, they all simultaneosuly undertake something like a campaign for impregnation. Thus if no South Wind presents himself to them, they spread their wings toward the known East Wind. Thence they are filled with the wind blowing in through their open mouths, and they bring forth animals, not wind eggs. This is the reason why nature requires a very long time for the completion of this animal. For it is difficult and laborious to draw a certain essence of birth from the wind and much more delicate and exacting to form an entire animal from it. Now, therefore, when you hear that a most pure virgin was made pregnant without commerce with any man since the Holy Spirit had previously overshadowed her and had dominion over her, as the prophet said who had come from Thaemane, it by no means diminishes the faith in this but seems actually to augment it notwithstanding its divergence from the beliefs of men. For in the case of the vulture also, conception from God is very admirably established. It is said in written records from India, however, that the vulture considers how she should become pregnant, and finding a stone, which they call *Eutocium* because it aids in the ease of delivery, places herself on it, shaking violently in a desire for young, and thus accomplishing her purpose. This stone is round like a ripe nut and, shaken like a bell, it gives forth a noise, another stone moving within. This too is said about the vulture, that, when it is anointed thoroughly with rose-perfume, it dies."

A hundred years later, the story appeared in *Li Livres dou tresor*, written about 1266 by Ser BRUNETTO LATINI, the friend and perhaps the teacher of DANTE. From Bk. I, pt. 5, Ch. 172—

" The Vulture.

" And they conceive without the union of male and female and bear offspring which live more than a hundred years. And know that they do not peck at any carrion without lifting it off the ground first. And they willingly go into the earth with the great claws that they have."

The records of the wind-impregnation of vultures are brought down to the fourteenth century by the work of MANUEL PHILES (1295-1346), a Byzantine naturalist, who wrote *De animalibus proprietate*. From (p. 21-23) Sec. 3—

" Vultures.

" This genus produces not masculine but feminine offspring which are fecundated by the South wind flowing into their body openings. Having received this breeze they actually give birth to young after the third month, although they have not been impregnated by a mate. Their nests, being without walls, offer success to a forcible seduction, but this is never seen, according to the experiences in Egypt. Here the vultures produced eggs fertilized by the seed of the male, by which means vultures are created who are like their ancestors neither in strength nor covering, since they are black just like the people dwelling near Pharos."

LUDOVICUS CAELUS RHODIGINUS (1516) relates the story in *Lectionum antiquarum commentarii*. From Bk. VIII, Ch. 18—

" ... Or because, as the Egyptians relate, and as AMBROSIUS seems to prove in the Hexaemeron, all vultures are female, and as trees are made pregnant by the zephyr (W. wind), so vultures are made pregnant by Eurus (E. wind or S. E.) or by Boreus (N. wind) as (HORAPOLLON) reports. In reality it is very true that powerful and sure signs are made therefrom. (HORAPOLLON) reports that the word " mother ", is portrayed by a hieroglyph in the image of a vulture. "

JOANNES RAVISIUS TEXTOR(1520) quoted the story of the vulture as well as that of the mares. From page 445b (Ed. of 1524)

" ... They say that this bird conceives without seed of the males and generates without copulation, and their offspring acquire a great age up to one hundred years. They are renowned for their odor. Black vultures are stronger, they build their nests on high cliffs, no one lays hands upon their nests. They are usually observed to have two offspring."

ULISSE ALDROVANDI (1522-1605) devoted an entire chapter to vultures in his *Ornithology* (Bk. III, Ch. I) first published in 1599. He described their wind foecundation in detail and reprinted a number of the earlier descriptions. In the next century NIEREMBERG in his *Historia naturae*, Antwerp, 1635, mentioned the wind fertilization of vultures. He quoted the passage in

THEOPHYLACTOS already cited and added (edition of 1675, Bk. VI, Ch. 7, p. 956)—

"... Antigonus writes, if they (the vultures) face the wind from the seas the females conceive. The regeneration of the Phoenix, a virgin bird, must be conceded to spontaneous origin. But since this is fabulous, so the other accounts are not certain enough."

Hens

Pullets normally lay eggs after they reach a certain age even if they have never been trodden by a cock, and thus the stories of the impregnation of hens by the wind are on a somewhat different plane from those of the mares and vultures. These sterile unfertilized eggs are sometimes referred to as virgin-eggs, but for centuries they were known as wind-eggs and it was supposed that they were produced by the fecundating power of the air. Thus hens have to be included in the list of the wind's consorts. ARISTOPHANES used the term, wind-egg, in his play *The Birds*, written in 414 B.C., (line 695) "In the beginning night laid a wind-egg," and ARISTOTLE described the production of such eggs in considerable detail both in the *De Generatione Animalium* (Bk. I, Ch. 21; Bk. II, Ch. 3; Bk. III, Ch. 1) and in the *Historia Animalium* (Bk. V, Ch. I; Bk. VI, Ch. 2). These passages are much too long to quote here. The following two short excerpts are sufficient, however, to illustrate an extremely early stage in the legend of the wind's activity. From *Gen. Animal.*, Bk. III : Ch. 1, p. 749b.

"Some embryos are formed in birds spontaneously, which are called wind-eggs and 'zephyria' by some."

From *Hist. Animal.*, Bk. VI, Ch. 2.

"Such as affirm that wind eggs are the residue of eggs previously begotten from copulation are mistaken in their assertion, for we have cases well authenticated where chickens of the common hen and goose have laid wind eggs without ever having been subjected to copulation... wind eggs are laid by a number of birds; as for instance by the common hen, the hen partridge, the hen pigeon, the peahen, the goose and the vulpanser."

VARRO and COLUMELLA mentioned wind-eggs in their description of the wind-impregnation of mares. On the other hand, PLINY

gave the hens the dignity of a separate treatment. From Pt. I, Bk. X, Ch. 60.

" Wind egs, which we call Hypenemia, come either by the mutuall treading of hens one another, by an imaginarie conceit of the male, or els by dust. And such egs not only Doves do bring, but house hens also, Partridges, Peahens, Geese, and Brants, or the female Barganders. Now these egs are barren as one would say, and never proove birds, lesse than others, not so pleasant in tast, and besides more moist. Some are of opinion that the wind will engender them : for which cause also they are called Zephyria (i.e. West-wind-egs :) and verily such egs are seen only in spring, when that wind bloweth. Addle egges, which some call Cynosura, are they that chill upon the nest,... "

Wind-eggs are mentioned by ATHENAEOS in his *Deipnosophistae* (192-200 A.D.), perhaps the most famous cook-book in history, and the wind-impregnation of hens is cited in the so-called *Recognitions* of CLEMENT (fourth quarter of the third century) as evdience of the reasonableness of the virgin birth of Christ just as LACTANTIUS and ST. AUGUSTINE had cited the story of the mares and as ORIGEN, EUSEBIUS, ST. BASIL and ST. AMBROSE used that of the vulture. From the *Recognitions*, Bk. VIII, Ch. 25—

" ... And not only males are produced, but females also, that by means of both the race may be perpetuated. But lest this should seem, as some think, to be done by a certain order of nature, and not by the appointment of the Creator, He has, as a proof and indication of His providence, ordained a few animals to preserve their stock on the earth in an exceptional way : for example, the crow conceives through the mouth, and the weasel brings forth through the ear; and some birds, such as hens, some times produce eggs conceived of wind or dust; other animals convert the male into female, and change their sex every year, as hares and hyaenas, which they call monsters; others spring from the earth, and get their bodies from it, as moles; others from ashes, as vipers; others from putrifying flesh, as wasps from horse-flesh, bees from ox-flesh; others from cow-dung as beetles; others from herbs, as the scorpion from the basil; and again, herbs from animals, as parsley and asparagus from the horn of the stag or the she-goat."

ALEXANDER NECKAM referred casually to wind-eggs in his account of the parthenogenetic foals. BARTHOLOMEW, the Englishman (BARTHOLOMEUS ANGLICUS), also described the eggs but did not mention the wind-impregnation of mares. The account is in *De proprietatibus rerum*, Bk. 19, Ch. 79, written sometime between 1230 and 1240. The following quotation is taken from the translation of JOHN OF TREVISA, printed at Westminster about the year 1495 :

" Some eggs ben conceyved in every wynde : but they ben bareyn but they

ben conceyved of tredynge other by werkyng of the male and thyrlyd wyth Seminall spyryte as he sayeth."

ALBERTUS MAGNUS (1193-1280) completed *De vegetabilibus* sometime before 1256. In his discussion of sex in plants he mentioned wind-eggs. From I, I, 12—

"Consequently, he says that a wind egg is not alive except potentially with a plant's life, but not an animal's; by a 'wind egg' he means one not impregnated by the cock."

Two hundred years after ALBERTUS MAGNUS, Archbishop PEROTTUS mentioned wind-eggs. From the *Cornucopiae* (P. 365 edition of 1521)—

"... a third which is worthless he calls urinum, as if full of the excrement of urine. Indeed the Greeks call urine οὖρον. Eggs from which nothing is born are called worthless (Irrita) by us, Hypenemia by the Greeks, as if ὑπὸ τοῦ ἀνέμου, that is conceived by the wind, and on this account they are called Zephyria by the Latins. These eggs are conceived by the imagination of desire of the females within themselves wholly without intercourse with a male: some people think that they are generated by the wind. In this they differ from the (Urina) because the (Urina) are deserted at incubation, and others call these addle eggs (Cynosura)."

In 1570 HERESBACH mentioned wind-eggs as well as the story of the mares. From *Foure Bookes of Husbandrie* (tr. by BARNABE GOOGE, Esq.), London, 1586, Ch. 169—

"The Hennes wyl treade one the others, but theyr Eggs never come to good, but are wind eggs."

HARDE in 1611 changed the meaning of the term somewhat:

"an egge laied with a soft skin or filme instead of a shell: a soft sheld egge: a wind egge."

One of the most amusing figurative uses of wind-egg occurs in *Wit without Money*, a play by BEAUMONT and FLETCHER produced in 1614. From Act I, Scene I—

"*Val.* Who bid you get 'em? Have you not threshing work enough, but children Must be bang'd out o' th' Sheaf too? Other Men With all their Delicates, and healthful Diets, Can get but wind Eggs: You wi' a Clove of Garlick, A piece of Cheese would break a Saw, and sowr Milk, Can mount like Stallions; and must I maintain These Tumblers?

Lance. You ought to Maintain us we."

This series of references to wind-eggs is brought to an adequate

conclusion by the scientific discussion of WILLIAM HARVEY, famed as the discoverer of the circulation of the blood. He wrote *De Generatione Animalium* in 1666. From page 219—

"The principal difference between eggs, however, is their fecundity or barrenness—the distinction of fruitful eggs from Hypenemic, adventitious, or wind eggs. Those eggs are called hypenemic, (as if the progeny of the wind,) that are produced without the concourse of the male, and are unfit for setting; although VARRO declares that the mares, in Lusitania, conceive by the wind. For Zephyrus was held a fertilizing wind, whence its name, as if it were *Ζωηφόρος*, or life bringing. So that VIRGIL says :

"And Zephyrus, with warming breath resolves
The bosom of the ground, and melting rains
Are poured o'er all, and every field brings forth.

"Hence the ancients, when with this wind blowing in the spring season, they saw their hens begin laying, without the concurrence of the cock, conceived that zephyrus, or the west wind, was the author of their fecundity. There are also what are called addle and dog-day eggs, produced by interrupted incubation, and so called because eggs often rot in the dog-days, being deserted by the hens in consequence of the excessive heat; and also becasue at this season of the year thunder is frequent; and ARISTOTLE asserts that eggs die if it thunders whilst the hen is sitting."

Women

When cause and effect are separated by a prolonged gestation period, the connection between them is easily lost, even by peoples whom we consider to be no longer primitive. We do not know just when the parental function of the male was first discovered. It could easily have been overlooked for a long while, for even to-day it is not recognized by some savage tribes. The mysteries of parturition were the subject of many primeval legends, however, and consequently the literature of many races is filled with accounts of miraculous births. The myths of the polytheistic Greeks and Romans are particularly rich in these instances and in stories of the philanderings of the Gods and Goddesses. It would have been remarkable if, alone among the minor deities, the personified winds had remained strictly celibate. Needless to say the winds often aspired above mares, vultures and hens and, according to OVID (43-17 B.C.) two of them, Boreas and Zephyrus, mated with nymphs. Significantly enough, the bride of the West Wind was called Flora and she it was who controlled all flowers. She describes her happy state in OVID's *Fasti V* (tr. by FRAZER) : 195, as follows—

"A Grecian nymph was I, Chloris my name—
Change but some letters, it becomes the same
As Flora, mark you—and among the Good
Within the Happy Fields was my abode.
How fair I was it scarce beseems to tell:
But to a god I deemed desirable.
For as I roamed abroad, one April day
The West Wind saw me, and, though I said nay,
Took me by force, as Boreas before
Took Orthyia on the Attic shore.
Still, for that wrong by wedlock he atoned
Nor have I cause to grieve, as consort owned.
Eternal spring is mine, trees ever green
Earth clothed in herbage, azure skies serene;
And as my bridal gift and marriage dower
He gave me governance of every flower."

If we except the tales of the personified winds and nymphs, we must look to China for the first stories of women being impregnated by inanimate objects, and we must consult particularly the works of the Chinese geographers. According to these savants, three different countries of women were located among the outer barbarians. The one they placed in the far west near Ta'ts'in or Fu-lin (the Eastern Roman Empire) was doubtless the oriental version of the country of the Amazons. The second country of women supposedly somewhere to the south of China may have been the land of the polyandrous hill tribes of India. The third country of women, located on an island to the east of China, is harder to identify. SCHLEGEL was of the opinion that it was purely mythological and originated from stories told by sailors of the islands visited by seals and sea-lions. This is a most plausible explanation of the peculiar inhabitants of this country and of their anatomical characteristics, viz., females without breasts but with the heads of Chinese women, males with the heads of dogs, a language which sounded like barking, etc.

Of course these countries became confused in the minds of many writers and in time the characteristics of each were transferred to the others. Originally the country of the Amazons was merely ruled by women; in the country to the south the women were not remarkable except for the fact that they had many husbands, but in the eastern island they employed novel means to perpetuate the race. From the stories of the eastern kingdom of women grew the legend of their wind-impregnation. The curious,

muddled growth of this legend is best shown by a chronological arrangement of the various records.

HUI-SHEN, a Buddist monk, seems to have been the first to describe the eastern country of women. In the year 499 he returned from a long journey to the east. Among the marvelous stories he told of the lands he had visited was one of this country. As translated by G. SCHLEGEL the story reads—

" *Nui Kouo :* The Isle of Women.

" HUI-SHEN in the year 499 A.D. came to *King-tcheou*, at that time the capital of the country, of Fousang, and related that one thousand miles east of Fousang, was the Country of women. That these women had a decent and correct air and that they were very white, although their bodies were hairy and their hair was so long that it trailed on the ground. That at the second or third month they hasten to enter the water, and become pregnant in this way. That they give birth the *sixth* or seventh month.

" That these women have no breasts at all on their chests, but that, behind their neck, spring out hairs; that from one of these white hairs a liquid comes out that serves to suckle their children. These children, continues HUI-SHEN, can walk a hundred days after their birth, from which I conclude that they are adults from their 3rd or 4th year (5) "

This fecundation by means of water instead of wind is a variation of the theme which reappeared at intervals for nearly a thousand years.

LI-YEN-SHOU wrote *Nan-shih* in the seventh century and in it he noted a peculiar race living to the east. As translated by SCHLEGEL,—

" In the sixth year of the period *Tien-kien* of the *Liang* (507 of our era), a man of Tsin-ngan (province of Fou-kien) who was crossing the sea, was cast by the winds upon an island; he set foot on land and found there inhabitants of which the women resembled those of China, but whose language he could not understand. The men had human bodies but *heads like dogs* (6), their voices resembled barking.

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(5) It is interesting to note that in the national epic of Finland, the *Kalevala*, the Virgin of the Air was impregnated by both wind and water. From Runo I, ines 131-136 (trans. by KIRBY)—

" Thus the tempest rocked the virgin
And the billows drove the maiden,
O'er the ocean's azure surface,
On the crest of foaming billows,
Till the wind that blew around her,
And the sea woke life within her."

(6) More than eight-hundred years later these people were described by a Christian traveller, Friar JORDANUS who wrote *Mirabila descripta*, 1324-1330;—

Their food consisted of little beans and their clothes were as if made of cloth. They constructed walls of clay of a round form with an entrance like a cave."

CHANG WEN-MING (634-713 A.D.) wrote *Ta-t'ang hsi-yii ch'iu-fa hao-seng ch'uan* probably in 648. He confused thoroughly the eastern with the western country of women. The Roman Emperor (king of Fo-lin), is depicted as being moved by enlightened self-interest, as follows—

" On an isle situated to the southwest of the realm of *Fo-lin*, is found the realm of eastern women. One sees only women, not a single man. This country contains a great number of rare and precious things which are sold in the realm of *Fo-lin*. That is why the king of *Fo-lin* every year sends men (7) to unite with them; but if they give birth to boys, the custom of the country does not permit them to be raised."

During the T'ang Dynasty (618-907 A.D.) appeared *Ta-huan-hsing-ching-chi*. As quoted by MA TUAN-LIN—

" There is also a report that in the west there is the country of women who, being affected by the influence of water, give birth to children."

By the tenth century the tale of the Island of Women reached the Mohammedan world. The Arabian geographers located this land in some of the most inaccessable regions, generally far to the east. BUZURG-IBN-SHAKRIYAR (912-1000 A.D.) described this country in his collection of sailors' stories, the *Marvels of India*, written shortly after 954. The following excerpt shows the legend in a most primitive form. It is taken from the French translations of L. MARCEL DEVIC. Pt. I, Ch. XX—

" There are many other different islands in which are men having the heads of dogs, but their women are said to be beautiful. I cease not to marvel at the great variety of islands that there be."

(7) From MARCO POLO (Bk. IV, Ch. 3) written in 1299 A.D.—

" Distant from Kesmacoran about five hundred miles toward the south, in the ocean, there are two islands within about thirty miles from each other. One of these is inhabited by men without the company of women, which is called the island of Males : and the other by women, which is called the Island of Females... The men visit the Island of Females and remain with them for three successive months, namely March, April, and May, each man occupying a separate habitation along with his wife. They then return to the male island, where they live the rest of the year, without the society of any female... This mode of living is occasioned by the peculiar nature of the climate, which does not allow of their remaining all the year with their wives unless at the risk of sacrifice."

" During these transports (of joy), suddenly from the interior of the island arrived a mob of women whose number God alone could count. They fell upon the men, a thousand or more women to each man. They dragged them toward the mountains and forced them to grow their instruments for their pleasure. There was a continuous struggle between them and a man belonged to the strongest. The men died of exhaustion one after another; and each time that one died, they still fell upon him without being bothered by the stinking odor of the corpse. A single man survived, he was a Spaniard whom one woman had carried off. She visited him at night, and at dawn she hid him near the sea and carried him food. Finally the wind changed and commenced to blow in the direction of the land of India whence the fleet had come. The man took a small boat called *Felou* and supplied it during the night with water and food. The woman, seeing his plan, led him to a place where, having pushed aside the earth, she revealed a mine of gold dust. They filled the boat with as much as it could hold. Then they both set out and after ten days of sailing reached the port whence the vessel came. There, he told of his adventure.

" The woman lived with the Spaniard, learned his language, became a Mohammedan and bore him several children. Questioned about that island and those women who lived away from the society of men, she spoke thus :

" ' ... One should know that, by the will of God, the women of this country bear first a boy, the second time two girls, and continue thus alternately the rest of their lives. Thus it happens that men are scarce in our country, and the women becoming more numerous, would dominate them. So the men would equip ships, embark with thousands of the women and throw them on that island saying to their God, the Sun : " To you belongs the right to what you have created; as for us, we have more of them than we can use."

" ' The women were thus left on the island, where they die one after another. No man had passed among us before you came. Never had one approached. Because our island is situated in a vast sea, under Canopus ; and no traveller could visit there and return; none would dare leave the shore and solid dry land for fear of being drowned in the ocean. Thus has willed the all Powerful. Blessed be God, the best of creators.' "

The Moslem, IBRAHIM IBN WASIF-SHAH, described the island of women. His version appeared in 1031 A.D. and in this version the inhabitants are impregnated by the wind. This tale appears to be only a variant of the older Chinese legend where water is the fecundating agent. As translated by FARRAND—

" *The Isle of Women.* This is an island situated at the limits of the China Sea. It is said that it is inhabited only by women who are fertilized by the wind and who bear only females; it is said that they are fertilized by a tree whose fruit they eat (8). Gold, it is claimed, shoots up, with them, in caves, like bamboo, and they are nourished with the gold. Once a man fell among them; they wished

(8) This method of impregnation is found in many other legends. According to OVID, Juno became pregnant by eating an herb given her by Flora and in due time she gave birth to Mars. In the *Kalevala* Marjatta finds all of her precautions to no avail and she becomes enceinte from eating a cranberry.

to kill him; but one of them had pity on him, placed him on a log and committed him to the sea. The waves and the winds bore him to the country of China. He went to find the king of China and told him of the isle. The king sent vessels to search for it but after three years of effort, they found no news nor traces of it. ... Others resemble women having hair and breasts; there is no male in this race; these females are made pregnant by the wind, and they bear only individuals which resemble them; they have ravishing voices and they attract many individuals of other races by the charm of their voices."

OU-YANG HSIU (1007-1072) was a contemporary of IBRAHIM. In his *Hsin T'ang shu* he repeated the earlier story of CHANG WEN-MING. As translated by JULIEN—

"According to the *Hsin-T'ang-shu* an island in the south-west of Fu-lin is inhabited by a tribe called "western women" who are all females. The country contains many precious articles and is a dependency of Fu-lin. The rulers of Fu-lin send males to them every year to couple with them. It is their custom not to bring up the male children they have borne. On the eastern sea there are likewise women with a female government, which is the cause of these being called eastern women."

Approximately a hundred years after OU-YANG HSIU, AL-MAZINI (1080-1170) wrote *Tuhfat al-albab, etc.* (1062). His story of the women is obviously from Chinese sources. As translated by FARRAND—

"It is said that in the deserts of Magrib there is a tribe of descendants of Adam all of which are women. There are no males among them, and none are seen in their country. These women enter into a water (p. 47) which is found among them and they become pregnant from this contact with the water. Each female bears a daughter and never bears a boy... But Allah is the most wise."

While the Moslem, AL-MAZINI, had the women fertilized by water, the Chinaman, CH'OU CH'Ü-FEI, had them impregnated by the wind. From the *Ling-wai-tai-ta* written in 1178 (tr. by FARRAND)—

"The Isle of Women.

"More to the southeast there is the realm of Women. The water flows unceasingly toward the east and overflows once in many years. On the water float grains of lotus more than a foot long and peach stones two feet long. When the inhabitants gather them they offer them to the queen. In days of old there was a vessel of commerce which was cast upon this kingdom. The women seized (the sailors) and took them away. At the end of several days they all died. One alone (more) discreet (than the others) got possession of a boat during the night and at the risk of his life succeeded in escaping. Afterward he related the affair. The women of this country, when the wind blows from the south, undress and conceive by the wind, all give birth to girls."

IBN TUFAIL (1150-1185) explains the miraculous births by a new method, (tr. by FARRAND)—

"Our virtuous predecessors report—May God be satisfied with them!—that there is an isle of India, situated under the equator, in which man is born without father nor mother. There is a tree there which in the guise of fruit, produces women; it is of these that Masudi speaks under the name of daughters of Wakwak."

CHAO JU-KUA described the land of the women in 1225 by quoting the passage in the *Ling-wai-tai-ta* of CH'OU CH'Ü-FEI.

AL QAZWINI's (1203-1285) revised geographical writings date from 1276. In the following passages he describes two of the countries of women (tr. by FARRAND).

"*The Isle of Women* in the China Sea. Women are found there and not a single man. They conceive by the wind and bring into the world females like themselves. It is also said that they conceive by eating the fruit of a tree which grows in their isle. They conceive and bring females into the world. A merchant relates that the wind bore him towards this isle. 'I saw here he said, women but not a single man with them. I saw in this isle gold as abundant as the ground and reeds of gold like bamboo. They wished to kill me, but one of them preserved me, put me on a plank and abandoned me to my fate on the sea. The wind brought me to China and I informed the sovereign of China of the nature of this island and the gold there was there. He sent out people in exploration who were absent three years, they never reached the isle and they came back again."

In the next passage QAZWINI describes women who kill all of their male offspring but keep male slaves.

"THE CITY OF WOMEN! This is a large city situated on an island of the sea of Maghrib. Turtusi says that its population is composed of women, over whom men have no power. They mount a horse and make war themselves; they are full of ardor and attack. They have male slaves; each of them comes in turn to pass the night with his mistress. He stays near her all night, and rises very early to leave without being seen before dawn breaks. When one of them bears a male child, she kills it immediately, but if it is a girl it is allowed to live. And Turtusi adds; the city of women certainly exists; there is no doubt about that."

MA TUAN-LIN completed *Wen hsien t'ung k'ao* in 1280 but did not publish it until 1319. SCHLEGEL describes his references to the country of women..

"... That these people had the practice *of plunging the virgins into the sea on the seventh month.* They relate again that there was a country in the sea inhabited entirely by women, without there being a single male there, etc., etc...

"The Ainos have a like tradition, with this difference that the women of this isle are said to be cannibals and kill men who have been shipwrecked on the

island after having abused them. Others say that these women *become pregnant on leaving the bath*, and facing the South wind, or, according to the Ainos, the East wind."

Twenty years after MA TUAN LIN, HAMDUALLAH MUSTAFAI (1339) related the story of the women with a number of variations (tr. by FARRAND).

" ... In the middle of this desert of sand rises a town which is inhabited only by women. If a man goes to establish himself there he loses all his virile qualities, due to the effect of the climate, and he soon dies. The propagation of the race is assured by means of a spring where the women go to bath, and which makes them pregnant, and they give birth to girls; if a boy is born unexpectedly from time to time he always dies young. When these women are purified of their menses, they reappear the second day after they have bathed in this spring, and so much blood flows that they are in danger of death.

" By an effect of the whole power of God most High, these women never have any passions; this is to such a degree that if one of them arrives at this province (le Maghrib), when a man has commerce with her, she becomes seriously sick; but when she stayed here a long time and has become used to this climate, the desire of passion takes her also."

About 1340, IBN AL-WARDI described the Island of Women (tr. by FARRAND)—

" THE ISLE OF WOMEN is large. They say that it has never had men on it. They relate that the women conceive by the wind. When they have become pregnant they give birth to (females) like themselves. Some people claim that in this isle there is a kind of tree whose (fruit) makes (the women) conceive when they eat it. Gold (springs up) in this country; its stems are like those of the bamboo. The earth also contains (mineral) gold, but the women (who inhabit this isle) pay no heed to it.

" It is related that a man was cast upon this isle by God. The women wished to kill him, but one of them had pity on him, put him on a small boat and abandoned him to the sea. He became the sport of the waves which bore him in to an isle of China. He related to the king (of this isle) what he had seen in the Isle of Women, in what concerned its inhabitants and the abundance of gold. The king sent ships and men with (the individual in question). They sailed for a long time on the sea, in search of the isle (of Women) but they found no trace of it."

AL-BAKUWI abstracted the geographical work of AL-QAZWINI in 1403-1404. His short account of the island of women follows—

" THE ISLE OF WOMEN. An island in the neighborhood of China; it is inhabited only by women. It is said that they become pregnant by the wind, or by eating the fruit of a certain tree which is in the country."

In the fifteenth century the Portuguese made the Arabia-India-

China trade very precarious and as a result the contacts of the Mediterranean Moslems with the Far East were very effectually broken. The story of the wind-impregnated women, however, continued to reach Europe. MAGELLAN's sailors heard the story in the East Indies on the first circumnavigation of the earth. The scribe of the expedition, ANTONIO PIGAFETTA, included the tale in the *First Voyage round the World* written in 1522. From the Hakluyt Soc. Pub. No. 154; Vol. II, p. 169—

" Our oldest pilot told us that in an island called Acaloro which is below Java Major, there are found no persons but Women, and that they become pregnant from the wind. When they bring forth, if the offspring is a male, they kill it, but if a female they rear it. If men go to that island of theirs, they kill them if they are able to do so."

Ultimately, of course, this story was not taken at its face value. JOHN MILTON in *L'allegro* (1640) found the legend very useful for its poetic effects.

" Or whether (as some sages sing)
The frolic wind that breathes the spring
Zephyr, with Aurora playing,
As he met her once a-maying.
There, on beds of violets blue,
And fresh-blown roses washed in dew,
Filled her with thee, a daughter fair.
So buxom, blithe and debonaire."

We would expect the stories of wind-impregnated females to die a natural death sometime within the sixteenth century, at least among the European scientists, even if the stories should remain alive in the orient. It is certain that the intellectual leaders no longer believed in the fecundating power of air. On the somewhat lower level of Natural Theology, however, the legend had a strange rebirth, surprisingly enough in the early eighteenth century. WILLIAM WOLLASTON was a London clergyman, who published for his friends in 1722 *The Religion of Nature Delineated* (9). This work became so popular that it was re-issued publicly in 1724, 1726, 1731, 1750, etc. WOLLASTON was committed to the theory that the souls of children were not generated by the souls of their parents and in order to support

(9) The type of this book was set in part by BENJ. FRANKLIN when he was a printer in London.

this view, he postulated an aerial origin for spermatozoa. Section five of his book was called " Truths relating to the Deity." The following extract is from truth number fifteen. From p. 89.—

" ... If then the *semina*, out of which animals are produced, are (as I doubt not) *animalcula* already formed; which, being distributed about, especially in some opportune places, are *taken in* with aliment, or perhaps thru the very air; being separated in the bodies of the *males* by strainers proper to every Kind, and then lodged in *their* seminal vessels, do *there* receive some kind of addition and influence; and being thence transferred into the wombs of the *females*, are *there* nourished more plentifully, and grow, till they become too big to be longer confined : I say, if this be the case, why may not those *additions* and the *nutriment* received from the parents, being prepared by their vessels, and of the same kind with which they themselves are nourished, be the same in great measure to the *animalcula* and embrya that it is to *them*, and consequently very much assimilate their young, without the derivation of anything else from them? Many impressions may be made upon the *foetus*, and tinctures given to the *fluids* communicated to it from the parents; and yet it, the *animal itself*, may not be originally raised in them, or traduced from them. This hypothesis (which has long been mine) suggests a reason, why the *child* is sometimes more like the *father*, sometimes the *mother :* viz. because the vessels of the *animalculum* are disposed to receive a greater proportion of aliment sometimes from the *one*, sometimes from the *other :* or the fluids and spirits in one may ferment and operate *more strongly* than in the other and so have a *greater* and more signal effect. (Here it ought to be observed, that tho what the *animalculum* receives from the father, is in quantity little in respect of all that nutriment, which it receives by the mother; yet the former, being the first accretion to the original *Stamina*, adhering immediately, and being early interwoven with them, may affect it more.) " (10)

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(10) Strange as it may seem to us, this passage greatly influenced JAMES LOGAN (1674-1751) a Colonial Governor of Pennsylvania. In 1735 LOGAN proved that the pollen of *Zea Mays* was the male element and that it was necessary for the production of viable seed *(Phil. Trans. Roy. Soc. London* 39 : 192-195*)*. His results were republished four years later, *Experimenta et Maletemata de Plantarum Generatione*, Leyden, 1739, and translated into English in 1747. LOGAN apparently thought that no really frugal Deity would have invented a method as wasteful as wind-pollination without some hidden reason. The following passage is from the English translation, *Experiments and Considerations on the Generation of Plants*, London, 1747.

" As therefore the Article of Generation has to this Time lain under insuperable Difficulties, and as all the methods of accounting for it, hitherto invented, have at last been found defective, why may we not suppose, that Nature herself points out the whole Process of the Affair; especially in forming the seminal Substance, distinct from the rest of the Seed? namely, that the Farina is for this Purpose committed to the Air, that it may receive out of the Air this little Seed or Plant, praeexistent and completely formed, tho' in *Stamina* inconceivably minute and invisible; and thus become pregnant hereby? It is drawn by an inherent attractive Force (like as the Males and Females of Animals we see are mutually, and even at a Distance, affected) first into the Style, and thru' that it slides by

To the best of my knowledge, this contribution of WOLLASTON's has had no direct effect upon biological thought. (11) Indirectly, however, it has exerted a beneficient influence upon all scientific development, for a copy of the 1750 edition of WOLLASTON's book fell into the hands of Sir JOHN HILL, M.D. At that time Sir JOHN was greatly chagrined for he had just failed to be elected to the Royal Society and he was inspired by WOLLASTON to attack the Society, an attack which was so devastating that it altered the whole tone of the Society's publications.

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proper Canals to the *Ova:* And from this *Farina*, nourished by the Juices of the Plant for the Purposes above described, the Bulk of the Seed is formed. Lastly, the little Plant hid in the Seed, and cloathed with a terrestrial Matter, which it borrows from the *Farina*, exerts itself; and, increasing by proper Nutriment, which it draws from the Earth, at length springs up.

Nor perhaps is this Method of accounting for Generation to be confin'd to Vegetables only; but it may, with equal Reason, be applied to the Production of every living Creature that makes a Part of this Universe of Things. 'Whatever in this World have Life (Plants as well as Animals) first of all exist completely formed in Miniature, or in their first Rudiments, and are taken from the Air or *Aether*. then, being cloathed with an earthly Substance, they increase and grow larger. Nor is Generation any thing else than the placing this Principle in the male Seed, where it acquires an earthly Nature, tho' not without some Portion of an *Aura coelestis*, and a proper Conveyance of it into a suitable *Matrix*, where it may grow and increase.' This was the Opinion of the ingenious *Claude Perrault* long ago, as well as of the celebrated *Wollaston* our Countryman, as appears from the Writings of these great Men."

(11) BENOÎT DE MAILLET (1656-1738) gave in *Telliamed: or the World Explained, Amsterdam*, 1748, an account of fertilization, which is almost identical with Wollaston's. The following quotation is from the Baltimore edition of 1797, pp. 264, 265:

"In order to understand this oeconomy of nature, imagine to yourself, Sir, that the whole extent of the air... is full of the seeds of everything which can live on earth...

When the male has arrived at a certain age, the seeds of his species re-unite in him, by the air which he respires, and the aliments with which he is nourished, according to a general law of nature, which wills that every thing should tend to be attached to its own species. Then these seeds are prepared for fertility in the vessels of the male, by the dispositions which puberty has put into them. If with a good microscope you examine the seed when warm, you will see it composed of small animals, like fish, which move up and down, but after the seed is grown cold they lose the motion, and, no doubt, the life which they had acquired in these vessels. Hence it is evident, that these seeds receive in the vessels of the male, a disposition to life, and to augmentation, which they had not when they were introduced thither.

These vessels therefore are a kind of first uterus, where the seeds are prepared for a greater growth, which they are to receive in the uterus of the female."

Sir JOHN began the fight with *Lucina sine Concubitu, a letter humbly addressed to the Royal Society*, London, 1750, purporting to be written by one ABRAHAM JOHNSON, a provincial doctor of medicine. In this essay, WOLLASTON is quoted and the quotation followed by an ironical passage, an excellent parody of many of the papers in the *Philosophical Transactions*. The collection of the floating spermatozoa is described as follows.

" Accordingly, after much Exercise of my Invention, I contrived a wonderful cylindrical catoptrical, rotundo-concavo-convex Machine (whereof a very exact Print will speedily be published for the Satisfaction of the Curious, designed by *Mr. H-y-n*, and engraved by *Mr. V--stu*) which being hermetically sealed at one end, and electrified according to the nicest laws of Electricity, I erected it in a convenient Attitude to the West, as a kind of Trap to intercept the floating Animalcula in that prolific Quarter of the Heavens. The Event answered my Expectation; and when I had caught a sufficient number of these small, original, unexpanded minims of Existence, I spread them out carefully like Silkworm Eggs, upon white Paper; and then applying my best Microscope, plainly discerned them to be little Men and Women exact in all their Limbs and Lineaments, and ready to offer themselves little Candidates for Life, whenever they should happen to be imbibed with Air or Nutriment, and conveyed down into the Vessels of Generation."

These animalculae were fed to the doctor's Chambermaid in a "Chymical" preparation. She later became astonished at her condition and the experiment was reported a success.

Although wind fertilization was now a joke in Europe it was still believed in the East Indies. In 1783, WILLIAM MARSDEN published his *History of Sumatra*, where, in reference to the Natives, he wrote (p. 297, Ed. of 1811)—

" Thus they believed that the inhabitants of the island Engano to be all females, who were impregnated by the wind; like the mares in VIRGILS *Georgics*."

BRONISLAW PILSUDSKI, an anthropologist, found this same belief still existing among the Ainu in the twentieth century, and described it in his *Materials for the Study of the Ainu language and folklore*, 1912. From p. 91.—

" In Yeso, an old man assured me that there was a whole island inhabited by women like the one in this tale. They were, however, able to bring forth children by exposing themselves to the East Wind, by which they became pregnant. They used to kill all their male children, and kept only their daugthers."

Conclusions

An examination of these descriptions of wind-impregnation reveals a number of interesting problems. The questions which naturally present themselves are—how did the stories originate, what was their *raison d'être?* Of course no definite answer can be given, for the tales are extremely old. HOMER knew of the penchant of the west wind for the mares and ARISTOPHANES casually referred to wind-eggs. The fecundation of vultures by the wind was an ancient Egyptian myth, we do not know how ancient, but it has the earmarks of extreme antiquity. These stories may even be relics of neolithic folk-lore, although it must be granted that the mere substitution of some inanimate impregnating object for the male is no proof of their barbaric origin, for, even in the early civilizations, the role of the father was difficult to establish empirically. Experimentation rarely gives unambiguous results in the absence of adequate controls, and consequently, the necessary prerequisites for parturition were not always recognized. The ancient myths of many peoples contain accounts of virgin births.

The real proof of the primitive character of the legends is shown by the choice of the wind as the fertilizing agent. To early man there was something immaterial about the wind. It could not be grasped, held or weighed. It blew where it listed and he could hear the sound thereof but could not tell whence it came or whither it went. Moreover in times of storms it was a power worth propitiating, but the breeze which blew in and out of the lungs was beneficial and even necessary for life. Thus the " breath of life " seemed a part of a great immaterial force. We have only to note the origin of our words for the spiritual to realize how the peculiar properties of moving air influenced the early interpretations of the universe. The Greeks used the word *pneuma* for both air and spirit. The Latin *spiritus* was a breath as well as a ghost and the Germanic *ghost* or *geist* originally meant a breeze (gust). Even as recently as a hundred years ago, it would have taken a very bold philosopher to deny that a pneuma, a spirit or a ghost could cause a virgin to bear offspring.

The actual transmission of the stories of mares, vultures and hens offers no serious problems. They passed from the Greeks to the Romans and from the Romans to the medieval Europeans. The only noteworthy aspect of their transmission is the credulity with which they were received. With a few minor exceptions, they were repeated without critical or skeptical comment. Indeed, during most of the two thousand years that they were accepted at face value, skepticism itself was not altogether reputable : it was certainly not a habit of mind. We will probably never know just how much intellectual standards delayed the growth of science.

The use of the stories of the mares, vultures and hens to support the dogma of the Virgin Birth gives us an interesting side light on the beliefs of the classical Pagans, and on the methods used by the Christians to secure converts. No less than eight of the early Fathers cited the wind's fecundating power to show that the Virgin Birth of Christ was not intrinsically unreasonable. The wind-eggs of hens are referred to in the *Recognitions* of CLEMENT. ORIGEN, EUSEBIUS, ST. BASIL, ST. AMBROSE and ST. ISIDORE described the wind-impregnation of vultures while LACTANTIUS and ST. AUGUSTINE referred to a like fertilization of mares. Their arguments must have been considered very effective for they were in use for several hundred years.

The stories of wind-impregnated women are not as easy to trace. Originally there seem to have been several different legends, which became so confused in the course of time that their individual elements were hopelessly mixed. These stories probably originated in China. In the earlier versions the women could be impregnated either by men or by bathing in certain waters, and it was only in the later form of the story that they were wind-impregnated. Our first record of this latter method is Arabic. This is no proof, of course, that the wind-impregnation represents an Arabic contribution to the legend, for our present sources of information are so incomplete that we cannot be positive that no Chinese geographer described this means of fecundating women before the time of IBRAHIM IBN WASIF-SHAH. Indeed the wind-impregnation may have been in the stories from the very beginning. It certainly appears in the earliest Ainu accounts. Just how it managed to supplant the other version is uncertain.

Whatever the method, it remained in both the Chinese and Arabian accounts for several centuries. When these stories reached Europe their resemblance to the stories of the mares and vultures was noted and commented upon, and finally, by the middle of the eighteenth century, they were no longer accepted as true. As recently as 1912, however, the Ainu tribes in Northern Japan believed that there was a country where there are no men and where the women were impregnated by the wind.

Chronological List of the Descriptions of Wind-Impregnation.

Date	Author	Animal Impregnated
800 + B.C.	Homer	Mares
414	Aristophanes	Hens
384-321	Aristotle	Mares, Vultures, Hens
118-30	Varro	Mares, Hens
31	Virgil	Mares
43-17	Ovid	Nymphs
30-40 A.D.	Columella	Mares, Hens
77	Pliny	Mares, Hens
25-101	Silius Italicus	Mares
46-125	Plutarch	Vultures
156-200?	Oppian	Tigers
192-200	Athenaos	Hens
200 +	Aelian	Ewes, Vultures
248	Origen	Vultures
200-280	*The Recognitions of Clement*	Hens
275-300?	Solinus	Mares
260-340	Lactantius	Mares
318	Eusebius	Vultures
300-400?	Horapollo	Vultures
330-379	St. Basil	Vultures
334-397	St. Ambrose	Vultures
400	Claudian	Tigers
400	Justin	Mares
413-426	St. Augustine	Mares
499	Hui-shen	Women *
550-600	Cassianos Bassos	Vultures
622-633	St. Isidore	Vultures
629	Theophylactos	Vultures
618-907?	*Tu-huan-hsing-ching-chi*	Women *
1031	Ibrahim ibm Wasif Sah	Women
1110	Tzetzes	Vultures
1143-1156	Michael Glycas	Vultures
1162	Al-Mazine	Women *
1178	Ch'ou ch'ü-fir	Women
1105-1185	Ibn Tufail	Women

1200	Alexander Neckam	Mares, Hens
1225	Chao Ju-Kua	Women
1230-1240	Bartholomew the Englishman	Hens
1246	Walter of Metz	Mares
1256	Albert the Great	Hens
1260-1266	Ser Brunetti Latini	Vultures
1268	Roger Bacon	Mares, Vultures
1276	Qazwini	Women
1295-1346	Philes	Vultures
1319	Ma-tuan-lin	Women •
1339	Hamdalla Mustawfi	Women •
1340	Ibn-al-Wardi	Women
1400-1450	Bakuwi	Women
1430-1480	Perottus	Mares, Hens
1516	Rhodiginus	Vultures
1520	Ravisius	Mares, Vultures
1522	Pigafetta	Women
1570	Heresbach	Mares, Hens
1599	Aldrovandi	Vultures
1611	Harde	Hens
1614	Johnston	Mares
1632	Beaumont & Fletcher	Hens
1635	Nieremberg	Mares, Vultures
1640	Milton	Women
1651	Harvey	Hens
1691	Camerarius	Mares, Hens
1722	Wollaston	Women
1750	Hill	Women
1783	Marsden	Women
1912	Pilsudsky	Women

• Impregnated by water.

The following bibliography lists only those works which are not cited adequately in the body of the paper.

Bibliography

BUZURG IBN SHAHRIYAR.—Marvels of India (tr. by L. MARCEL DEVIC), Leiden, 1886.

FERRAND, GABRIEL.—Relations de Voyages et textes géographiques arabes, persans et turcs. Paris, 1913.

D'HERVEY DE SAINT-DENYS, M. J. L.—Ethnographie des peuples étrangers à la Chine. 2 Vol. Paris, 1876-1883.

HIRTH, FRIEDRICH.—China and Roman Orient. Leipzig & Munich, 1885.

HIRTH, FRIEDRICH and ROCKHILL, W. W.—Chau-Ju-kua. St. Petersburg, 1911.

MARSDEN, WILLIAM.—History of Sumatra, etc. London, 1783.

AL-MAZINI.—Le Tuhfat al-Albab (tr. by FARRAND). *Jour. Asiatique* ser. 12, Vol. 6, p. 47, 1925.

PILSUDSKI, BRONISLAW.—Materials for the study of the Ainu language and folklore. Cracow, 1912.

ROCKHILL, W. W.—Land of the Lamas. New York, 1891.
SCHLEGEL, GUSTAV.—Problèmes Géographiques III. Le pays des Femmes. *T'oung Pao* 3:495-510, 1892.
THOMPSON, D. W.—Glossary of Greek Birds. Oxford, 1895.

Philadelphia, Pa. CONWAY ZIRKLE.

Notes and Correspondence

Editorial Board of Isis.—On August 7, 1935, Dr. SHIO SAKANISHI of the Library of Congress, Washington, D.C., has been appointed an associate editor in charge of " Eastern Asia."

With her kind permission we are able to publish the following information about her :

" I was born on Dec. 6, 1899 in Tokyo, Japan, but brought up in Hokkaido, the northern island. In 1915, I entered the Tokyo Women's College, but after two and a half years I withdrew, because I could not stand the academic intolerance. In 1918, I took the Department of Education examinations in Classics, which gave me the same standing as a graduate of any college. In the following year I entered the Tokyo Imperial University as an auditor; a woman was not admitted to the University as a regular student.

" In 1922, I came to this country and entered Wheaton College, Mass. and received A.B. in 1925; M.A. from the University of Michigan in 1926; Ph. D. from Michigan in the field of English literature in 1929.

" From 1926 to 1929 I was the graduate assistant in the Department of Philosophy at Michigan. During the summers of 1927 and 1928, I assisted in the Department of English. In 1929, I went to Hollins College, Virginia, to teach English literature and theory of criticism. From July 1930 to date I have been connected with the Division of Orientalia, Library of Congress, and I am in charge of the Section on Japan."

I may add that the Japanese collection of the Library of Congress includes some 20,000 volumes, while the Chinese one includes some 150,000.

To conclude we hope that thanks to Dr. SAKANISHI's cooperation we will be able to publish in the future more complete accounts of the studies on the history of science and culture concerning Eastern Asia or originating in that part of the world. No history of mankind can be tolerably complete which does not pay considerable attention to the vicissitudes and to the contributions of Asia. We are very anxious to explain the East to the West, as well as the West to the East—because we believe that these two halves of the world are complementary, and

that each has a great deal to learn from the other if it is but willing to learn (not simply to teach). The Japanese, standing as it were between the two civilizations, should be the best interpreters of the Far East, even as the Arabs were the best interpreters between Europe on the one hand, and Western Asia and India on the other. GEORGE SARTON.

Dr. JOHN FARQUHAR FULTON, Stirling professor of physiology in Yale University since 1930, has kindly consented to become a member of the editorial board of *Isis*, his (*Isis*) domain being " the seventeenth century." Our readers know that Professor FULTON is not only a very distinguished physiologist, but also a historian of physiology, whose works have often been studied in *Isis*. Within recent years he has concentrated his attention more and more upon English scientists of the seventeenth century such as ROBERT BOYLE, RICHARD LOWER, JOHN MAYOW, THOMAS WILLIS, ROBERT HOOKE, to some of whom he has already devoted very elaborate bibliographies. We trust that *Isis* will benefit from his increasing familiarity with that great period.

G. S.

Query no. 58.—The views of Immanuel Bonfils of Tarascon (fl. c. 1340-77) on decimal fractions?

According to ERNEST RENAN and ADOLPH NEUBAUER : Ecrivains juifs français du XIV^e^ siècle (*Histoire littéraire de la France*, vol. 31, 694, 1893) one of the unpublished writings of the Judeo-Provençal astronomer IMMANUEL BONFILS, entitled *Derek ḥilluq* (ways of division), deals with decimal fractions. Their complete statement reads as follows :

" Note sur les chiffres décimaux, désignant des nombres entiers ou des fractions qu'on trouve dans le manuscrit de Paris 1054.6."

It would be very desirable to publish that note and eventually to translate it in order that its contents might be available to historians of mathematics. It is possible that it does not deal with decimal fractions, but I would not be too surprised if it did. In my paper on the first explanation of decimal fractions and measures (*Isis* 23, 153-244, 1935), I referred very briefly to the *Sefer ha-mispar* of ELIJAH BEN ABRAHAM MIZRAḤI printed posthumously in Constantinople c. 1532 (see p. 173, figs. 45-46). I referred to the *Sefer ha-mispar* because it contains decimal separators in the shape of vertical lines, even as we see them in the *Exempel Büchlin* of CHRISTOFF RUDOLFF (1530). Compare my figs. 44-46. As MIZRAḤI died c. 1525, he may have been the initiator, though his book was probably a little posterior to RUDOLFF's.

What was the origin of MIZRAḤI's views? Was there perhaps a

Jewish tradition on the subject? It is possible that the *Derek ḥilluq* may throw some light on that subject.

A connection between IMMANUEL BONFILS and MIZRAḤI is very plausible. Indeed IMMANUEL's famous tables, *Kanfe nesharim* (wings of eagles) or *Shesh kenafayim* (six wings) were very well known in the Qaraite circles, witness many Qaraite MSS., editions, adaptations and commentaries (1). They were also known in Byzantine circles, through the commentary of GEORGIOS CHRYSOCOCCES. Now ELIJAH BEN ABRAHAM MIZRAḤI was not a Qaraite, but he had spent all his life in Constantinople (he was born there c. 1455; became ḥakam bashi, grand rabbi, and died there c. 1525); hence he must have known of a book which was well known to the Qaraite and the Greek communities, and if he knew the *Kanfe nesharim* he may have known other writings of IBRAHIM BONFILS and obtained his views on decimal fractions from him.

The matter deserves to be elucidated, for it would open an important chapter in the history of mediaeval Hebrew arithmetic.

I have just verified that MIZRAḤI's teacher, MORDECAI COMTINO (1402-82) also used a vertical bar to separate fractions from integers, but his fractions were sexagesimal. See PINCUS SCHUB: A mathematical text by MORDECAI COMTINO (*Isis* 17, 54-70, 1932, p. 65).

This query was privately communicated to Dr. SOLOMON GANDZ together with photostats of the Hebrew Ms. The results of his investigations appear in the present number of *Isis*, together with the Hebrew text and an English translation. IMMANUEL BONFILS was a forerunner of STEVIN.

GEORGE SARTON.

Query no. 59.—I am looking for the work of Rev. F. JOSEPH STEPLING, Soc. Jesu, Prague (1716-78), "Brevicula descriptio Speculae astronomicae Pragae instructae," Wittebergae, 1755. The author being the founder of the Prague Observatory (1751) the work is probably of great importance for its history. The inquiry through the "Auskunftstelle d. Deutschen Bibliotheken Berlin" was unsuccessful. It seems probable that the work in question is not a monograph but that it has been published in a contemporaneous journal that is unknown to me.

National Obervatory, Praha I, Clementinum. Dr. OTTO SEYDL.

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(1) I shall discuss this in vol. 3 of my *Introduction*, which I am now engaged in preparing.

Query no. 60.—Documents concerning Henry Augustus Rowland (1848-1901).—The undersigned who is preparing a biography of ROWLAND and a study of his work and influence, will be grateful for the communication of any letters or documents concerning him.

These will be copied and faithfully returned, and due credit given to the owner.

(*Massachusetts Institute of Technology, Cambridge, Mass.*) ROBERT S. WOODBURY.

Answer no. 52.—Sator arepo formula.

This is not a regular answer to the question (*Isis*, 24, 107) but *Sator arepo* dilettanti will be glad to add the following items to their collection. E. SUYS (S. J.) : Une incantation célèbre (*Humanitas*, 122-6, 1927). J. VAN OOTEGHEM (S. J.) : Le rébus *Sator* (*Etudes classiques*, vol. 3, 557-8, 1934). E. SUYS : La formule *Sator* est-elle chrétienne (*ibidem*, vol. 4, 291-4, 1935). G. DE JERPHANION (S. J.) : Encore la formule *Sator arepo* (*ibidem*, 438-40, 1935); La formule magique *Sator arepo*, Vieilles théories et faits nouveaux (*Recherches de science religieuse*, 188-225, avril 1935). G. S.

Notes on Dr. Sarton's article "The first explanation of decimal fractions..." (*Isis* 23, 153-245, 1935).—(Section 77). It is possible to over-emphasize the slowness with which Hindu numerals were adopted in the Middle Ages. Although Roman numerals survived in popular usage, and in occasional curious fossilized forms among scholars, in many cases this seems to have been the result of convention rather than ignorance or awkwardness in handling the new forms. Particularly in astronomical tables Hindu numerals were used almost exclusively from the 12th century onward. Although HILL's survey of the early use of Hindu numerals may be fairly complete in regard to monumental, numismatic and artistic examples, it obviously represents only an infinitesimal fraction of the manuscript material. The surviving manuscripts of astronomical tables in European libraries run into the thousands. HILL has only drawn on a few examples available in British libraries, and a number of specimens communicated to him by continental scholars. Moreover, although it is true that many of the calendars printed in Germany for popular consumption employed Roman numerals. a large number of the manuscript versions, like the astronomical tables, used the Hindu forms. These remarks are not intended to contradict the view that the assimilation of Hindu numerals was a gradual and uneven process, but merely to caution against exaggeration. (Section 109) The decimal division of angles and units of time by 15th-century German

scientists should probably be traced back to JOHANN VON GMUNDEN, who also attempted to fuse decimal and sexagesimal bases in the extraction of square roots (section 85). The idea evidently had some currency, for it is represented in at least three fifteenth-century manuscripts besides the one copied by THEODORIC RUFFI in 1445. For example CLM 8950 and Berlin MS. lat. 2° 54 both have versions of the same table, employing decimal fractions of angle and time. Both of these manuscripts are earlier than that of RUFFI; CLM 8950 may be as early as 1424, and shows very plainly the influence of JOHANN VON GMUNDEN. I might also mention the note "Ad distanciam duarum civitatum inveniendam" in CLM 125, fol. 293 v., 294 r., which ends as follows :

"Eciam nota quod canon prefatus intelligi de fractionibus centenariis, vidilicet quod unus gradus continet 100 minuta. Et sic 50 minuta correspondent medio gradui, etc."

This manuscript was written in 1486 at Cracow by JACOBUS DE HERBIPOLI. It is thus clear that the decimal division enjoyed a fairly wide currency in the 15th century, and there is at least one instance of its survival in the 16th (MS. Vind. lat. 5176, fol. 125 v., 126 r.)

(Harvard University.) DANA B. DURAND.

Apropos of Henry Lyte (note to SARTON's First explanation of decimal fractions, *Isis* 23, 158, 1935).—There is no special article in the *Dictionary of national biography* for HENRY LYTE, author of *The art of tens*, London, 1619 (facsimile, *Isis* 23, 223), but it is not correct to say that he is not dealt with. He is mentioned at the end of the article devoted to his father, HENRY LYTE (1529?-1607), the translator of REMBERT DODOENS' herbal, the *Cruydeboeck*. The importance of this translation is fully shown in Dr. AGNES ARBER's *Herbals*, Cambridge, 1912, pp. 106-08; see also E. S. ROHDE, *The Old English Herbals*, London, 1922, pp. 94-96.

HENRY LYTE, the arithmetician, was the translator's third son. The following notes concerning him are taken from an article by Sir HENRY CHURCHILL MAXWELL LYTE entitled, *The Lytes of Lytescary*, in the *Proceedings of the Somersetshire Archaeological and Natural History Society*, vol. 38, pt. II, pp. 57-58, 1892 : "HENRY, born 17 December 1573 [presumably at Lytescary]. Under the will of his grandmother, MARGARET MARWOOD, he received some land at East Sealake, co. Devon, which he sold in 1599. A small book entitled, *The art of Tens and Decimal Arithmetike, as taught in a more exact and perfect method, avoyding the intricacies of fractions, exercised by Henry Lyte, gentleman, and by him set forth for his countrie's good*, was published in London, in 1619, with a dedication to CHARLES, Prince of Wales. In this the author declares his intention of teaching his system in various towns of England.

Although a pioneer of the art in his native country, he appears to have borrowed freely from a French work entitled *La Disme*, published in 1590 [this should read 1585]. By SIBILLA, his wife, daughter of JOHN MARKEY of Walford, co. Hereford, HENRY LYTE the younger had issue, five children who died young, HENRY, FRANCES, FRANCES, ELEANOR, and MARY, two more, ALICE and ANNE, of whom no particulars are given, and yet two more, ALICE, the wife of JOHN HARDY of Ireland, and LUCY, the wife of SAMUEL HYET of Ross. SIBILLA his relict, described as ' of Alton in the parish of Ross,' co. Hereford, died in 1637."

It is interesting to note that Sir HENRY LYTE (b. 1848) is the grandson of the Rev. HENRY FRANCIS LYTE (1793-1847), author of the hymn, *Abide with me*, and a direct descendant of HENRY LYTE, the Elizabethan herbalist.

(London.) R. E. OCKENDEN.

Note on the history of the loxodrome. (Addition to SARTON's article on STEVIN, *Isis* 21, 279, 1934).—The Greek word *loxodromia* in the Latin edition of STEVIN's *Hypomnemata* (1605), edition for which SNEL was responsible, corresponds to STEVIN's Dutch word *cromstreeck*. That word is also used by HUYGENS *(Œuvres Complètes*, vol. 17, 236-237); the orthography varying somewhat. For example, HUYGENS wrote *cromstreeck-reekningh*, STEVIN, *cromstreex rekeninge*.

(Leiden.) J. A. VOLLGRAFF.

Prix Binoux.—Le Prix BINOUX de l'Académie des sciences, la plus haute récompense pour l'histoire et la philosophie des sciences (non seulement la plus haute, mais à peu près la seule qui existe dans le monde) a été attribué en 1935 comme suit :

« Le Prix de 2000 fr. est décerné à M. GEORGE SARTON, fondateur et directeur de la revue *Isis*, membre associé de l'Institution Carnegie de Washington, pour ses trois volumes sur une Introduction à l'histoire des sciences depuis l'antiquité jusqu'à ROGER BACON;

« Un prix de 1000 fr. est décerné à M. HENRI L. BRUGMANS, docteur de l'Université de Paris, pour son ouvrage intitulé: *Le séjour de* CHRISTIAN HUYGENS *à Paris, suivi de son Journal de voyage de Paris à Londres.* »

C'est la deuxième fois que le Prix BINOUX est décerné à M. SARTON. Il l'a reçu la première fois en 1915. Voir la note consacrée à LOUIS FRANÇOIS BINOUX (mort en 1896) et au Prix BINOUX dans *Isis* 8, 161-3, 1926. Cette note, dérivée du livre de PIERRE GAUJA sur les fondations de l'Académie (Hendaye 1917, 389-91) contient la liste des lauréats, depuis le début, 1903, jusqu'en 1924.

Grâce à l'amabilité de M. GAUJA, je puis donner ci-dessous la liste supplémentaire de 1925 à 1934.

1925. ALBERT MAIRE, bibliothécaire honoraire de l'Université de Paris, pour sa bibliographie de PASCAL savant (*Isis* 9, 370-2).

1926. HENRY DE VARIGNY, pour son ouvrage intitulé : *La mort et la biologie* (*Isis* 11, 249).

1927. HENRI DAUDIN, chargé de cours à la Faculté des lettres de Bordeaux, pour ses ouvrages intitulés : *De* LINNÉ *à* JUSSIEU, et CUVIER *et* LAMARCK (*Isis* 10, 502-5).

1928. ANDRÉ METZ, pour son ouvrage intitulé : *Une nouvelle philosophie des sciences. Le causalisme de* M. EMILE MEYERSON (*Isis* 11, 149-50).

1929. PROSPER JULES CHARBONNIER, inspecteur général d'artillerie navale, pour ses *Essais sur l'histoire de la balistique* (*Isis* 15, 376-80).

1930. PIERRE BRUNET, professeur au lycée de Sens, pour ses ouvrages intitulés : *Les physiciens hollandais et la méthode expérimentale en France au XVIII*e *siècle* (*Isis* 10, 173); MAUPERTUIS (*Isis* 15, 177-9).

NIELS NIELSEN, professeur à l'Université de Copenhague, pour son ouvrage intitulé : *Géomètres français sous la Révolution* (*Isis* 16, 502).

1931. LOUIS DE NUSSAC, sous-bibliothécaire au Muséum, pour son ouvrage intitulé : *Les débuts d'un savant naturaliste, le prince de l'entomologie*, PIERRE-ANDRÉ LATREILLE.

1932. ABEL REY, professeur à la Faculté des lettres de Paris, pour l'ensemble de ses travaux sur l'histoire des sciences (*Isis* passim).

1933. LOUIS PASTEUR-VALLERY-RADOT, professeur agrégé à la Faculté de médecine de Paris, médecin des hôpitaux, pour sa contribution à la publication des Œuvres de PASTEUR (*Isis* passim).

1934. PAUL BAUD, chargé d'enseignement à la Sorbonne, pour son ouvrage intitulé : *L'industrie chimique en France, étude historique et géographique.*

RAOUL COMBES, professeur à la Sorbonne, pour son ouvrage intitulé : *Histoire de la biologie végétale en France.*

The History of Science in Japan.—Some time ago I promised to find out about the History of Science Society in Japan. There is no general history of science society, but there is a strong and growing society for the history of medicine. It was founded in the latter part of 1926 by the late Dr. SHUZO KURE, who was a pioneer in the field. The present head is Dr. TATSUKICHI IRIZAWA and the office of the *Nihon Ishi-kai* is no. 9 Nishikatamachi, Hongo, Tokyo. The annual dues are five yen. The society publishes a monthly journal entitled *Chugai Iji shimpo*. The above information was supplied by Dr. NIRE ONJIN of Kyoto Imperial University.

Only two medical schools have a chair of history of medical science, and they are Keio Medical School in Tokyo and Tohoku Imperial University in Sendai. These colleges have small societies devoted to historical study and they have monthly meetings where both faculty and students present papers. So far, medicine is the only branch of science in which a special effort has been made and made successfully to study its history. However, the other branches are not without scholars who are keenly interested in them. For example : Dr. S. KUWAKI of Kyushu Imperial, in physics; Dr. KINNOSUKE OGURA of Osaka University, in mathematics; Dr. JOJI SAKURAI of the Imperial Academy, in chemistry; Dr. YOSHIO MIKAMI, in mathematics. The above information was supplied by Dr. S. HARASHIMA of the Dept. of Preventive Medicine, Keio University, Tokyo, Japan. SHIO SAKANISHI.

San Francisco Medical History Seminar.—Luncheon in honor of Dr. and Mrs. S. LARKEY, given by the San Francisco Medical History Seminar, on Monday September 16, 1935.

The Seminar discussed Galenical anatomy in the sixteenth century, a subject to which Dr. LARKEY has given much attention. The discussion was opened with an essay by the late Dr. LEROY CRUMMER on LOYS VASSE, who in 1540 issued the last great anatomical text based wholly on GALEN. Through the courtesy of Mrs. MYRTLE CRUMMER INGRAM, editions of this very rare work were exhibited.

History of Science Society.—*Program of Saint Louis Meeting, January 2-3, 1936.*

President, C. A. BROWNE, U. S. Bureau of Chemistry, Washington, D.C.
Secretary, F. E. BRASCH, Library of Congress, Washington, D.C.

Thursday morning joint sesssion with Section on historical and philological sciences (L) of A.A.A.S. and Academy of Science of Saint Louis, January 2, 10 : 00 a.m.; Room A, Mayfair Hotel.
Symposium : *Study and teaching of the history of science*
GEORGE SARTON, *Chairman*

1. H. T. DAVIS (Indiana University) : History of science as a principal guide in teaching.
2. L. C. KARPINSKI (University of Michigan) : The advantages of treating the history of arithmetic and algebra in one course and the history of geometry and trigonometry in another course.
3. U. G. MITCHELL (University of Kansas) : The study and teaching of the history of mathematics.

4. ROBERT S. WOODBURY (Massachusetts Institute of Technology) : The teaching of the history of science in an engineering school.

Thursday afternoon joint session with Section on historical and philological sciences (L) and Academy of Science of Saint Louis, January 2, 2 : 00 p.m; Room A, Mayfair Hotel.

5. CHARLES W. MORRIS (University of Chicago) : A cooperative method of teaching the history of science.

6. HARCOURT BROWN (Washington University) : From DESCARTES to BAYLE; a study of motives.

Thursday afternoon joint session with Section on historical and philological sciences (L) and Academy of Science of Saint Louis, January 2, 4 : 30 p.m.; Room A, Mayfair Hotel.

7. SOLON J. BUCK (National Archives, Washington, D.C.) : The national archives and the advancement of science.

Address of the retiring vice-president for Section L, A.A.A.S.

Symposium : ***Early science in the Saint Louis area.***

Friday morning joint session with Section on historical and philological sciences (L) and Academy of Science of Saint Louis, January 3, 10 : 00 a.m.; Room A, Mayfair Hotel.

CHAUNCEY D. LEAKE, *Chairman.*

8. C. A. BROWNE (U. S. Bureau of Chemistry and Soils, Washington, D.C.) : Some relations of the New Harmony movement to the history of science in America. Retiring presidential address of History of Science Society.

9. ROBERT E. SCHLUETER (Saint Louis, Mo.) : FREDERICK ADOLPHUS WISLIZENUS (1810-1889), a pioneer meteorologist, physician and natural scientist.

10. WILLIAM H. ROEVER (Washington University) : The life of WILLIAM CHAUVENET (1819-1870), a pioneer mathematician and astronomer.

11. JOSEPH GRINDON (Saint Louis, Mo.) : The early history of the Academy of Science of Saint Louis.

Friday afternoon joint session with Section on historical and philological sciences (L) and Academy of Science of Saint Louis, January 3, 2 : 00 p.m.; Room A, Mayfair Hotel.

Symposium : ***Early science in the Saint Louis area, Continued.***

C. A. BROWNE, *Chairman*

12. CHAUNCEY D. LEAKE (University of California Medical School) : JAMES BLAKE (1815-1893), a pioneer Saint Louis scientist.

13. A. B. HERTZMAN (Saint Louis, Mo.) : WILLIAM BEAUMONT (1785-1853), a photographic record.

14. JESSE M. GREENMAN (Missouri Botanical Garden, Saint Louis,

Mo.) : THOMAS NUTTAL (1786-1859), his place in the history of American science.

15. CHARLES F. SHERWIN (Saint L uis, Mo.) : BENJAMIN F. SHUMARD (1820-1869), physician and scientist.

Birthday celebration for Dr. David Eugene Smith.—On the afternoon of January 21, 1936, the Columbia University Library held a tea in celebration of Dr. DAVID EUGENE SMITH's seventy-sixth birthday. Some eighty-five of his friends gathered to commemorate the occasion.

An exhibit of Dr. SMITH's most recent gift to the Library had been arranged, consisting in the display of some two hundred and seventy-five mathematical and astronomical instruments of historical interest. Included among them are celestial spheres of the seventeenth century, astrolabes of intricate and delicate workmanship, some fifty sundials from Europe and Asia, compasses dating from the beginning of the Christian era, armillary spheres, quadrants, a large number of measuring rods and sets of weights of various periods and from many countries. With these were displayed books illustrating the various uses to which the medieval scientists put these instruments. Many of the books include drawings and diagrams demonstrating the mathematical principles involved.

The high light of the occasion, however, was the presentation of a *Festschrift* issued in honor of Dr. SMITH's birthday, as a complete surprise to him. The book, known as the *David Eugene Smith Presentation Volume*, was conceived and edited by Dr. GEORGE SARTON and is Volume I of *Osiris*, a series of independent volumes which are to be supplementary to *Isis*. This monumental volume of nearly eight hundred pages contains articles dealing with different aspects of the history of science and mathematics — the contributions of forty scholars from many countries. Dr. SARTON, in presenting a beautifully bound copy to Dr. SMITH, spoke of his place of honor and influence in the history of mathematics field. With the publication of this volume a little of the gratitude, admiration and love which his friends hold for him will be perpetuated.

(Columbia University) BERTHA MARGARET FRICK

Reviews

Job of Edessa.—*Encyclopaedia of philosophical and natural sciences* as taught in Baghdad about A.D. 817, or *Book of treasures* by JOB OF EDESSA. Syriac text edited and translated with a critical apparatus by A. MINGANA. XLVIII+470 p. (Vol. I of *Woodbrooke scientific publications*). Cambridge, HEFFER, 1935 (£ 2.2.0).

Nothing can give the reviewer more pleasure than to discover how one note after another of vol. I of his *Introduction* is becoming obsolete because of the very progress of our studies. The most remarkable instance is that of JOB OF EDESSA, the Spotted (*Introduction* 1, 574). The note devoted to him was already too short in the light of the knowledge which had been revealed by the late BERGSTRÄSSER's book on ḤUNAIN IBN IṢḤĀQ (1925, *Isis* 8, 685-724). I should have dealt more elaborately with his activity as a Galenic translator. However, the present book proves that JOB OF EDESSA was not simply a diligent translator from Greek into Syriac, but also a philosopher and encyclopaedist who continued the glorious tradition of SEVERUS SEBOKHT (VII-2).

According to the editor, JOB OF EDESSA was born possibly c. 760 and died c. 835, but he does not justify sufficiently his acceptance of those two dates. JOB " belonged by birth either to the Melchite or to the West Syrian or Jacobite community, which he left in order to join the East Syrian or Nestorian Church." In addition to the Book of treasures (1), he wrote various other works in Syriac : (2) on the soul, (3) on the causes of fevers, (4) on canine hydrophobia, (5) on urine, (6) on faith, (7) on ten syllogisms, (8) on the five senses, (9) on essences, (10) on the causes of the coming into existence of the universe from the elements.

No. 10 and other titles may refer to parts of (1). Thus far the text of only two of them (1 and 4) has come down to us, both in the same MS. —Mingana 559—written in Caesarea 1221 and collated with the original in the same town in 1222. It is a large Ms. containing in addition to JOB's two treatises, problems of ALEXANDER OF APHRODISIAS, medical questions excerpted from GALEN's writings, a treatise on the four elements by ḤUNAIN IBN IṢḤĀQ, etc.

According to MINGANA's *Catalogue* (1933, col. 1034-39) " the MS. was copied for me in 1930 by the priest MICHAEL of Ḥomṣ." That

is, the MS. used by him and reproduced in this edition is not the MS. of 1221 (the present location of which is not indicated) but the copy made in 1930. There would be no great harm in this, if we could be sure that the collation had been done carefully, and if the editor stated these facts more openly.

To return to the *Book of treasures*, it is a scientific encyclopaedia covering in the English translation 292 pages in large print. It is divided into six parts or " discourses," of the contents of which I shall try to give an idea as briefly as possible.

Discourse I (33 chapters).—Elements, theology, anatomy—Elements, matter, how did the elements come together; existence, oneness and infinity of God, creation of the elements ex nihilo, compound elements which fall under the senses and have three dimensions, genesis of the three genera : animals, animal-plants and plants; four humours; the consideration of the humours leads to anatomy and physiology (Galenic physiology; the influence of the *De usu partium* being particularly noticeable). Chapters 11 to 33 are thus devoted to anatomy. For the sake of illustration I quote the editor's titles of three chapters (p. IX) :

> XXVI. On the reason why five fingers came into existence on every hand, and five toes on every foot, and why the thumb and the big toe are thicker and larger than the rest; XXVII. On the reason why all the body bends forwards and not backwards; XXVIII. On the reason why, at the end of the movement of elongation upwards, a round head came into existence, and at the end of the movement of elongation downwards our lower part became long, and the legs were made like a kind of triangle.

Discourse II (23 chapters).—Anatomy and zoology—Heat and cold are active powers, humidity and dryness, passive ones. Ticklishness. Sleep. Sexes. Beard, hair. Menstruation. Teeth. Anatomical differences according to climates. Animals, animal-plants, plants. Soul. Species of animals. Comparative anatomy. E.g.:

> " XVII. The reason why in the first composition the genera and species of man, horse, ox, et cetera, came into existence from the elements, and did not vary from the beginning up till now; while other species come into existence in our days such as flies, midges, tape-worms, et cetera."

Discourse III (20 chapters).—Psychology—Tastes, colours and vision, smells and smelling, sounds and hearing. Five senses (why not more).

Discourse IV (18 chapters).—Chemistry and geology—Metals, gold,..., sulphur, bitumen, alum. Geography and geology. Springs. Earthquakes. Saltiness of the sea, etc.

Discourse V (26 chapters).—Meteorology and astronomy.

Discourse VI (11 chapters).—Angelology and eschatology.

This plan is very comprehensive, if not very logical. According to MINGANA's calculations, the book was completed about 817.

JOB OF EDESSA refers several times to ARISTOTLE, twice to GALEN, once to HIPPOCRATES. He also refers vaguely to Hindu and Persian sages. Obviously he was not of the " quoting " type. He was certainly very well acquainted with ARISTOTLE and GALEN; on the other hand the *Almagest* was unknown to him.

He insists " on the fact that the main thesis of his work, the emanation of the genera and species from the elements, is original. This originality applies in a particular way to the formation of the various animal organs : head, hands, feet, toes, inner organs, organs of the five senses, hair, nails, etc. He emphatically asserts in Chapter VIII of the Second Discourse, that he had not found this subject discussed in any book written by the Indian, Persian, Greek or Syrian scholars who had preceded him, and on p. 279 he asserts that in this book ' he has not troubled anybody with the labours of others " (p. xxv).

His influence was naturally limited to Syrian circles. It was detected by MINGANA in BAR 'ALĪ's lexicon, and what is more remarkable, in the *Firdaus al-ḥikma* of 'ALĪ IBN RABBĀN AL-ṬABARĪ (*Introd.*, 1, 574; *Isis* 16, 6-54, 1931). I am not convinced that that statement concerning 'ALĪ AL-ṬABARĪ is correct. The latter does not mention JOB by name, and the six cases of similarity between the arguments of both authors adduced by MINGANA could be easily explained by the use of a common source. This matter requires investigation.

In his introduction, the editor examines briefly JOB's views under the following headings : *(a)* metaphysics; *(b)* theology; *(c)* psychology; *(d)* biology, anatomy and physiology; *(e)* medicine; *(f)* chemistry and physics; *(g)* music; *(h)* mathematics; *(i)* astronomy. His own scientific ideas are rather shaky, witness the following sentence on p. xxxiv:

" Having preceded PASTEUR and his bacteriological experiments by more than a thousand years, he believes that the lower forms of life, as represented by fleas, lice, tape-worms and such like, are derived from the action of the elements working in corrupted bodies, and that such lower forms of life do not procreate " (?!).

His discussion of numerals is not quite clear to me, and in the absence of references to the text I was not able to separate the editor's interpretation from JOB's own sayings. The theory of the cipher being " a circular link between number nine and number one," and the explanation of its circular shape, would not apply at least to the Arabic numerals, for in the Arabic script the cipher is represented by a dot, while the circle represents the number five.

The text is not edited in the scientific sense; we are simply given a facsimile of a copy made in 1930 by an oriental scribe from a MS. of 1221 the present location of which is not indicated. There are no

emendations, very few critical notes, and what is worse, no glossary. Obviously the editor has only done a part of his duty. Nevertheless we are exceedingly grateful to him for having given us this new and very important treatise. Other scholars will complete his task, but from now on the personality of JOB OF EDESSA has grown to a larger size and we must revise our opinion of Syrian science. Let us hope that the editor will give us other proofs of the scientific activity of his mediaeval ancestors, and thus oblige us to rewrite completely the early history of Arabic science. GEORGE SARTON.

Julius Ruska.—*Das Buch der Alaune und Salze.* Ein Grundwerk der spätlateinischen Alchemie. Herausgegeben, übersetzt und erläutert. 127 p. Berlin, Verlag Chemie, 1935 (Lwd. geb. RM. 15).

Attentive readers of *Isis* may remember ROBERT STEELE's paper "Practical chemistry in the twelfth century. RASIS *de aluminibus et salibus*, translated by GERARD OF CREMONA," which we published in our volume XII, p. 10-16, 1929. That text was extremely interesting because it revealed a new aspect of mediaeval alchemy, not the allegorical, mystical, esoterical and bombastic aspect which the word "alchemy" ordinarily evokes, but a practical and modest aspect anticipating modern chemistry. The scope of that treatise is larger than the title "on alums and salts" indicates; it really deals with most of the chemicals known to honest experimenters about the end of the tenth century.

STEELE's paper had the merit of drawing the attention of historians of chemistry to that Razian text which represented Arabic alchemy at its best. However, as JULIUS RUSKA has told us repeatedly with increasing conviction, we cannot hope to know Arabic alchemy and understand its genesis, devolopment, and influence, except if we approach it from the Arabic angle. That seems obvious enough, and yet does not seem to enter into the head of the average historian of science. RUSKA himself had already given admirable examples of the Arabic approach to the study of mediaeval alchemy in his books on JA'FAR AL-ṢĀDIQ (1924; *Isis* 7, 119-21), on the *Tabula smaragdina* (1926; *Isis* 9, 375-7), on the *Turba philosophorum* (1931; *Isis* 20, 302-5), not to speak of shorter papers. Similar investigations had been published in Calcutta at intervals since 1905 by H. E. STAPLETON and his collaborators, and those great examples were followed by ERIC JOHN HOLMYARD, and last but not least, by RUSKA's brilliant disciple PAUL KRAUS, well known to our readers because of his studies on JĀBIR IBN ḤAYYĀN (*Isis* 15, 7-30, 1931), who is now preparing a magnum opus on this same JĀBIR (the "GEBER" of Latin writers) and his circle.

Within recent years RUSKA had turned his attention to RĀZĪ, the famous

Persian physician, who was born in 865, flourished in Ray and Baghdâd and died in 923-24 (1). He has now completed a large book on RĀZĪ which would have been published if recent developments of German politics had been more favorable to the progress of learning. As it is, the author's only way of saving his work from oblivion is to publish its *disjecta membra* wherever possible. A part dealing with the *Sirr al-asrār (Secreta secretorum)* has just appeared in the *Quellen und Studien* (4, 3, 1935; *Isis*, 25, 189), another part, in the journal *Der Islam* (vol. 22, *Isis* 25, 190). The present volume is devoted to the study of the Arabic text of the *De aluminibus et salibus (Kitāb al-shubūb wal-amlāḥ)*. That text, or at least a large part of it (some 50 chapters out of 83) has been identified by RUSKA in the Berlin Cod. Sprenger 1908, and is here carefully edited. The Latin text had been well known in mediaeval times, witness abundant quotations from it in the *Speculum naturale* of VINCENT OF BEAUVAIS, references to it by ROGER BACON and unmistakable traces of its influence in the *Liber claritatis*. Moreover RUSKA identified it with a *Compendium alchemiae*, or *Tractatus de salium aluminumque varietate, compositione et usu scriptoris incerti*, which was printed a long time ago in JOANNES GARLANDIUS : *De mineralibus liber* (Basel, 1560). This GARLANDIUS text is here reprinted, and a German translation is added. In addition to STEELE's text of 1929, we are thus given here three other texts of that famous book, in Arabic, Latin, and German.

The main sources of the author of the *Kitāb al-shubūb wal-amlāḥ* were the writings ascribed to JĀBIR and RĀZĪ, and he was also acquainted with some writings of the Egyptian circle. The author however was not a compiler, but a practical chemist. RUSKA concludes that he was not RĀZĪ himself, but a Spaniard who flourished probably a century later. He discusses more fully the chemical significance of that text in the article published in *Der Islam*.

The present volume is a model publication, except for the absence of a glossary, which is inexcusable. GEORGE SARTON.

Josef Weinberg.—*Die Algebra des* ABŪ KĀMIL ŠOGĀ' BEN ASLAM. 144 pp. Munich 1935 (Selbstverlag, price RM 30).

ABŪ KĀMIL SHUJĀ' (2) al-Ḥāsib al-Misirī, the Egyptian mathematician,

(1) See my *Introduction*, 1, 609-10. Thanks to various new publications chiefly by RUSKA and M. MEYERHOF, that note, if I had to rewrite it, would be considerably expanded. See MEYERHOF : Thirty three clinical observations by RHAZES, with Arabic text (*Isis* 23, 321-72, 1935; 16 p. in Arabic). By the way, I made a mistake in calling the second half of the ninth century the " time of AL-RĀZĪ " for the latter's activity belongs as much to the tenth as to the ninth century, if not more.

(2) The name SHUJĀ' means " bold, courageous, brave " and is also applied

flourished in Egypt around 900. After AL-KHUWĀRIZMĪ (c. 825), he is the oldest Arabic algebraist whose work was preserved. ABŪ KĀMIL's algebra is the second oldest Arabic algebra that has come down to us, and it reprensents the continuation and perfection of AL-KHUWĀRIZMĪ's algebra, which is the first of its kind. AL-KARKHĪ (c. 1010) and LEONARDO OF PISA (c. 1200) used it rather extensively, and through them ABŪ KĀMIL exerted a great influence on the development of algebra in the Middle Ages. And yet the *Encyclopaedia of Islam* has no article about ABŪ KĀMIL, a fact which is rather significant for the neglect of the Arabian scientists by the modern Arabic philologist.

ABŪ KĀMIL's work on the Pentagon and Decagon was translated into Italian by SACERDOTE and into German by SUTER (3). His *Ṭarā'if*, the Book on the rare and fine things in mathematics, was also translated into German by SUTER (4). His algebra, however, is his most valuable work, and SARTON in his *Introduction to the History of Science*, I, 631, recommended an English translation as highly desirable. Dr. WEINBERG deserves great credit for making the algebra accessible in a German translation with a long and valuable introduction. Thanks are also due to the SCHOCKEN Company which financed the publication of the book.

The Arabic original of the algebra is lost, but its Latin and Hebrew translations are preserved in manuscripts of the Paris and Munich libraries. Dr. WEINBERG's German translation was prepared from the Hebrew translation of MORDECAI FINZI, available in a Munich MS. FINZI, a Jewish Italian physician and mathematician, started to work on his Hebrew translation in November of 1473. The Hebrew title *Taḥbulot ha-mispar*, however, seems to be a rendering of the Arabic *Ṭarā'if al-ḥisāb*, " The fine problems of the reckoning." From some of the loanwords still preserved in the Hebrew translation it was proved that FINZI must have used a Spanish version of the algebra. In the present volume we thus have before us a German translation of a Hebrew version prepared from a Spanish rendering of a Latin translation of the Arabic original. In his preface, however, Dr. WEINBERG promises to edit in the near future the Hebrew text of FINZI's translation, to which edition the students of Hebrew literature will look forwards with great interest. WEINBERG availed himself of the two Hebrew MSS. extant in the libraries of Paris and Munich. The reviewer would like to call

to a kind of a water snake asserted to be the boldest of the snakes. AL-SHUJA' is also the Arabic name of the long constellation of the *Hydra*, which lies in the southern heavens near the ecliptic; see *Encyclopaedia of Islam*, IV, 389.

(3) The former appeared in the *Festschrift zum 80sten Geburtstage Steinschneider's*, Leipzig 1896, and the latter in the *Bibliotheca Mathematica*, X, 1910.

(4) *Bibliotheca Mathematica*, XI, 1911.

his attention to the reported existence of a third MS. STEINSCHEIDER (5) referred to a Hebrew MS. which was in the possession of BISLICHS, a Hebrew book dealer who lived in Brody and Paris 1800-1851, and about which FUERST reported in A. GEIGER's *Wissenschaftliche Zeitschrift* (6). FUERST report reads: "Algebra von Abu Khamel, ins Hebraeische uebersetzt von Moseh Finzo in der bibliotheca Vaticana. 112 S. 4." The last words mean that the MS. had 112 pages in quarto. But the words "in der bibliotheca Vaticana" are not clear to me. Does it mean that BISLICHS copied the work from a MS. of the Vatican library? I failed to find such a MS. in ASSEMANI's Catalog of the Vatican library. At any rate, it would be interesting to find out where this BISLICHS MS. is now located, and it is to be hoped that Dr. WEINBERG will be able to throw more light on the subject.

(*New York City.*) SOLOMON GANDZ.

Gregory Zilboorg.—The medical man and the witch during the Renaissance. x+215 p. (*Publications of the Institute of the History of Medicine, the Johns Hopkins University*, 3rd series, vol. 2). Baltimore, Johns Hopkins Press, 1935 ($2.50).

This handsome little book will give pleasure to many readers, and to some it will be the revelation of a new subject. Not very new. When I gave a course on the sixteenth century in Harvard University many years ago (1918), I devoted a lecture to the *Malleus* and to WEYER as a matter of course, and I was not conscious of doing anything very original. CARL BINZ's studies of 1885-96 (7) were introduced to English readers in an excellent essay by EDWARD THEODORE WITHINGTON: "Dr. JOHN WEYER and the witch mania" (SINGER's *Studies in the history and method of science*, Oxford, 1917, 189-224). Nevertheless one could not speak too often of that very great man, JOHN WEYER, and of the contemporary delusions which gave to his activities their heroical proportions, and it is well that it be done as in this case by a distinguished psychiatrist, for it is essentially in all its aspects a psychopathological study—dealing as it does not only with the aberrations of a few individuals but with mass-neuroses or mass-psychoses.

Dr. ZILBOORG begins his account with a chapter on "the physiological and psychological aspects of the *Malleus maleficarum*." That infamous book, one of the wickedest books ever printed, was composed with the

(5) *Hebraeische Uebersetzungen*, p. 585.

(6) Vol. 3, Stuttgart 1837, p. 286, no. 37.

(7) Twenty years earlier Dr. AXENFELD had lectured on WEYER before the medical Faculty of Paris, "JEAN WIER *et la sorcellerie* (95 p., Paris, 1866).

Apologia auctoris in malleum maleficarum.

Dum inter ruentis seculi calamitates: quas proh dolor non tam legi/mus q̃ passim cernimur. vetus oriens damno sue ruine irrefragabili/ssoluetus ecclesiã quã nouus oriens homo christus iesus aspersione sui sanguinis fecundauit licet ab initio varijs hereseum contagioni/bus inficere nõ cessat. illo tñ precipue in tpe his conatur. quando mundi vi/ge ad occasum declinante ⁊ malicia hoim excrescente. nouit in ira magna. vt Job. in Apoc. testatur: se modicũ tempus habere. Quare et insolitã quandam hereti/cam prauitatẽ in agro dñico succrescere fecit: hereseum inquam maleficaꝝ. a prin/cipalioꝝ in quo vigere nosc̃atur sexu: denotando. Que dum innumeris machi/natur insultibꝫ. hoc tamẽ in singulis: quod cogitatu terribile: deo nimiũ abomi/nabile: et oĩbus christifidelibꝫ odibile cernitur. operibus expletur. Ex pacto enĩ cum inferno ⁊ federe cum morte: fetidissime seruituti. pro ea⁊ prauis explendis spurcicijs se subijciũt. Ceterea ea que in quotidianis erumnis: hominibus. iu/mentis ⁊ terre frugibꝫ ab eis deo permittente ⁊ virtute demonũ cõcurrente infe/runtur. Inter que mala: nos inquisitores Jacobus sprenger. vna cum charissi/mo ab apostolica sede in exterminiũ tam pestifere hereseos socio deputato: licet in/ter vtriuoꝝ eloquiorũ professores sub predicatoꝝ ordine militantiũ minimi. Pio tamen ac lugubri affectu pensantes quid remedij quidve solaminis mortalibus ipijs p salutari antidoto foret amministrandũ. huic opi pe cunctis alijs reme/dijs: pios submittere humeros vtgnũ iudicauimus confisi de melliflua largita/te illius: qui dat omnibꝫ affluenter. et qui calculo sumpto de altari. forpice tan/git et mundat labia imperfectoꝝ in finem optatũ cũcta pducere. Cterum cum in operibus hominũ nil fiat adeo vile et liuidum: cui nõ possit aliqua pruicies irro/gari. Ingeniola etiã nostra ad acumen nõ pueniunt veritatis. nisi lima alterius prauitatis plurimũ fuerint abrasa. Ideo qui de nouitate opis nos redarguen/dos estimat. ad certamẽ illius confidẽter accedimus. Sciat tñ hoc ipsum opus nouum esse simul et antiquũ. breue piter et plurum. antiquum certe materia et auctoritate: nouũ vero pruiz compilatõne earũq; aggregatõne. breue, pter plu/rimorum auctoruz in breuem pstrictõem. longum nihilominus, pter immen/sam materie multitudinẽ ⁊ maleficaꝝ imperscrutabilẽ maliciam. Hec hoc dici/mus ceteroꝝ auctoruz scriptis presumptuose derogando nostrũq; opus iactan/ter et inaniter extollendo. cum ex nostro ingenio pauca ⁊ quasi nulla sint addita Non nõ nẽm opus: sed illoꝝ potius censẽt quoꝝ ex dictis fere sunt singula cõcer/ta. Qua sit ex causa nec poemata condere nec sublimes threnias cepimꝰ extẽde/re: sed excerptoꝝ more, perdendo: Ad honorẽ summe trinitatis ⁊ indiuidue vni/tatis. sup tres pres principales. originẽ. pgressum et finem. Maleficaꝝ malleuz tractatũ nuncupando aggredimur. recollectõnem opis socio. exccutõnem vero his quibus iudicium durissimũ imminet. eo q̃ in vindictam malor: laudẽ vero honoꝝ pstituti cernũtur a deo. cui omnis honor ⁊ gloria in secula seculoꝝ Amen.

FIG. 1. The *Malleus maleficarum* was one of the most benevolent and maleficent books ever published. The incunabula editions (about five) have no real title-pages. I reproduce JACOB SPRENGER'S *Apologia*, illustrating his good intentions, from the copy of the earliest edition (c. 1490?), by courtesy of the Library of Congress and Mr. F. E. BRASCH. I have marked with a little arrow the line where SPRENGER'S name appears. The selfsame *Apologia* (except for minor grammatical variations) occurs in the edition of 1496 (folio I verso) of which I own a copy. G. S.

best of intentions by two Dominicans, JACOB SPRENGER and HEINRICH KRAEMER (INSTITORIS), in compliance with INNOCENT VIII's bull *Summis desiderantes affectibus* of Dec. 5, 1484. The *Malleus* first appeared c. 1487-89, became the vade-mecum of inquisitors and was frequently reprinted until as late as 1669. A German translation by J. W. R. SCHMIDT appeared in 1906 (3 vols., with introduction and index), and an English one by SUMMERS in 1928 (1 vol. folio 320 p., including elaborate introduction and bibliography). The Reverend MONTAGUE SUMMERS (b. 1880) professes to believe in witches; he has perhaps discovered that there are so many irrational, sadistic and other crazy individuals in our own " scientific " days that pandering to their tastes is a profitable business (8). ZILBOORG concludes his analysis of the *Malleus* with the remark that

> " It might with a little editing serve as an excellent modern textbook of descriptive clinical psychiatry of the fifteenth century, if the word witch were substituted by the word patient, and the devil eliminated. It must be said, however, that although the clinical pictures in general seem similar to those of the present day, the trends—cannibalistic, mystic, delusionary fancies of being possessed by the devil—are the outstanding characteristic of that historical period. As ESQUIROL pointed out more than a century ago, the mentally sick center their delusionary trends around some outstanding feature of their age—in the fifteenth and sixteenth centuries it was the devil, in the eighteenth century the Jacobins or the Bourbons, and in the nineteenth century the police " (p. 58). The *Malleus* might also be considered a textbook of sexual psychopathies.

In the second lecture " Medicine and the witch in the sixteenth century," the author explains how that century reacted to the delusions which were so effectively fostered by the *Malleus* complex and the witch persecutions. Most people lived in a demoniac atmosphere. In his *Pseudomonarchia daemonum* (1577), WEYER estimated the total number of demons and evil spirits to be 7,405,926 commanded over by seventy-two princes of darkness. How he managed to count them so exactly I do not know and shall not bother to investigate. One could not praise too highly the few, very few, individuals who dared and tried to counteract those infernal delusions, men such as CORNELIUS AGRIPPA (d. 1535), JUAN LUIS VIVES (d. 1540), PARACELSUS (d. 1541), WEYER (d. 1588), NICOLAS LEPOIS (d. 1590). The first of these was a German, the second a Spaniard (who lived mainly in Flanders and England, and died in Bruges), the third a Swiss, the fifth, a Frenchman, and the fourth and greatest of them all, a Dutchman.

The third and last chapter—the climax of these lectures—is devoted to " JOHANN WEYER, the founder of modern psychiatry." The author, by the way, does not say that that great man was a Dutchman. He

(8) *Isis* 10, 293; 11, 261; 13, 138; 14, 560; 16, 497.

continues to give the impression that WEYER was a German, the more so because he writes Dutch proper names (9) in a German way, following slavishly his German source. There is no justificacion whatever for writing Dutch names German-wise in an English book ! Of course the Germans have annexed WEYER in their *Allgemeine Deutsche Biographie*, as they have annexed countless other Dutchmen, Belgians, Swiss and Danes, but that proves nothing. WEYER was an authentic Dutchman, not a German.

He was undoubtedly one of the very greatest men of the sixteenth century. Says the author

" The first of that period to investigate independently before arguing, to observe and demonstrate rather than to indulge in traditional bookish protestations, he was a singular and quite fortunate combination of keen irony such as only a RABELAIS or a MONTAIGNE could boast of, scientific steadiness, and persistent studiousness which was not equalled by any of his medical predecessors or contemporaries. From the very outset WEYER proceeded to look upon the demoniacal world about him as an enormous clinic teeming with sick people. He set himself the task of making careful clinical studies and of using his spare time to subject to critical analysis the entire literature of his field " (p. 113).

The *De praestigiis daemonum* (see facsimile) which appeared for the first time in 1563 is one of the golden books of the world's literature. It is a strictly scientific book but informed with a spirit of toleration and charity which was rare enough in his days, and not too common alas ! in our own. It is that rare combination of objectivity and rationalism on the one hand and of charity on the other which lifts up that little book high above a multitude of others. He would remark (in book VI, quoted p. 132) : " Love your fellow beings, destroy errors, fight for the truth without any cruelty; (and remember the Apostle who said) let those exercise against us their cruelty who do not know with what pain truth is obtained and with what great difficulties one guards one's self against errors." His insistence that women should be treated with special leniency (they were the main victims of the witch madness), was also very remarkable in a time when insane ideas anent the wickedness of women were still popular.

Let me add a few technical remarks, for it is these which gave their main value to Dr. ZILBOORG's lectures :

" WEYER not only attempts to describe the whole process of the formation of delusions and hallucinations, but also to bring some unity into the whole problem by conceiving the process as a series of gradations in the relationship between sensation received from external stimuli and their intrapsychic representations.

(9) E.g., Arnheim for Arnhem.

Under particularly severe circumstances these become independent generators of pathological images such as delusions and hallucinations" (p. 160).

"This process of individualization and humanization, probably the most important factor in the development of a sound medical psychology, was reflected in an interest in the *ideational content* of mental reactions rather than in their forms alone. *De praestigiis daemonum* is probably the only medical work with this advanced psychopathological viewpoint written before the pupils of PINEL

DE
PRAESTIGIIS
DAEMONVM, ET IN-
cantationibus, ac uene-
ficijs, Libri V.

Authore IOANNE VVIE-
RO Medico.

Totius Operis Argumentum in Præ-
fatione comperies.

Nolite uos consortes esse dæmoniorum.
1. *Corinth.* 10.
Resistite diabolo, & fugiet à uobis.
Iacobi 4.

Cum Cæsareæ Maiest. gratia
& priuilegio.

BASILEAE, PER IOAN-
nem Oporinum. 1563.

FIG. 2. Title-page of first edition of the *De praestigiis daemonum* (Basel, 1563), one of the greatest books in the whole history of science. Courtesy of Harvard Library. G. S.

began their contributions during the course of the first quarter of the nineteenth century (ESQUIROL, GEORGET, FALRET, BAYLE)" (p. 166).

"WEYER evidently believed that even abnormal behavior which had the appearance of being voluntary should be regarded as a psychopathological problem —a contention which from the standpoint of scientific psychiatry is as advanced as it is pregnant with numerous potentialities. It is precisely this orientation in present-day psychiatry which made possible the most recent valuable contributions to the psychopathology of crime" (p. 177).

"WEYER's historical contribution is not his humane attitude towards witches, nor even his emphatic recognition that witches were mentally sick women, but his founding of a real clinical psychopathology which endured in spite of every cruel opposition. The seventeenth and eighteenth centuries imperceptibly, at times unknowingly, followed the clinical path first broken by WEYER. In short, WEYER's accomplishment was twofold: first, he introduced the scientific, descriptive, observational method to clinical psychopathology, and second, he reclaimed the whole field of psychopathology for medicine" (p. 205).

Judging by the number of editions it cannot be said that WEYER's book was unsuccessful. First published in 1563, it was reprinted in Latin in 1564, 1566, 1568, 1577, 1583, and finally in the *Opera omnia* of 1660; it appeared in German in 1567, 1586, and in French in 1567, 1569, 1885. That is, at least twelve editions, not to speak of other works of his. Nevertheless, few people were able to understand him: "He was talking like a rational being to the inmates of a gigantic insane asylum, and undoubtedly with the same success." The few who helped him deserve a part of his praise, above all his generous patron the Duke WILLEM III of Jülich, Cleve and Berg, bishop SIMON SULZER of Basel, the Benedictine abbot, ANTON HOVAEUS of Echternach, and very few others. His name was soon put on the *Index librorum prohibitorum*, among the *auctores primae classis* (i.e., the worst ones) (10). Among his chief accusers were JEAN BODIN (1530-96), who was hardly able to rise above the level of the *Malleus maleficorum* then a century old, the Jesuit M. A. DELRIO (1551-1608), and even medical colleagues such as his friend HERMANN NEUWALDT of Helmstaedt and W. A. SCRIBONIUS of Marburg.

The book is beautifully got up, even as its predecessor in the same series, Dr. ARTURO CASTIGLIONI's delightful lectures on the *Renaissance of medicine in Italy* (1934, *Isis* 22, 413). Our only regret is that its relatively high price will prevent it from attaining the circulation it ought to have in medical circles.

GEORGE SARTON.

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(10) I am glad to say I did not find it any more in the *Indice dei libri proibiti* (Città del Vaticano 1929; *Isis* 14, 568).

Mikhail Vasilyevich Lomonosov—*Collected Works.* Vols. vi-vii (Leningrad, 1934).

The Collected Works of the great Russian physical chemist, M. V. LOMONOSOV (1711-1765), have recently been published by the Soviet Academy of Sciences. They contain material of a purely literary character, for LOMONOSOV gave form to the Russian language as a literary vehicle, and writings on historical, philosophical, and scientific subjects. Vols. VI and VII, printed at Leningrad in 1934, are the only ones which we have seen and are of particular interest to the student of the history of chemistry. The large volumes are beautifully printed on paper of good quality, clearly and with wide margins, and are handsomely illustrated.

Vol. VI, IX + 438 + 131 pages, edited by B. N. MENSHUTKIN and G. M. KNYAZEV with a Preface by MENSHUTKIN, contains LOMONOSOV's dissertations on physical and chemical subjects, some of them in Latin and some in Russian, now for the first time printed in their original form—only extracts and incomplete translations having been published heretofore by MENSHUTKIN in Russian and, in Vol. 178 of OSTWALD's *Klassiker der exacten Wissenschaften*, in German (1). The volume contains pictures of the aurora borealis printed from LOMONOSOV's original copper plates which were found about 25 years ago. Particularly notable among the contents are the "Elements of Mathematical Chemistry" (1741) in which LOMONOSOV defines chemistry as "the science of the changes which take place in a compound body whatever the compound body is," the treatise "On the insensible physical particles constituting natural bodies in which sufficient reason for their particular qualities is contained" (1742), and the "Course in True Physical Chemistry" (1752) which commences as follows —"Physical chemistry is the science which derives from the principles and experiments of physics the reasons for the phenomena which take place in compound bodies through chemical operations. It may also be called chemical philosophy but in a sense different from that mystical philosophy in which not only the reasons fade but the operations themselves are carried out secretly." Twelve hundred copies of Vol. VI were printed but many of them were badly injured by flood and only about 350 were actually made up. The valuable book is accordingly already "scarce."

Vol. VII, iii + 591 pages, edited by MENSHUTKIN, contains LOMONOSOV's metallurgical works, "Chemical and Optical Notices" written by him in 1761 and intended for a special paper which he did

(1) See G. SARTON : *Le bicentenaire de la naissance de* M. V. LOMONOSOFF (*Revue générale des sciences*, vol. 23, 300-301, 1912).

not write, and papers on geographical and astronomical subjects. One paper is in Latin, one is in Swedish from the Latin of LOMONOSOV, the others are in Russian. A translation by LOMONOSOV into Russian of a work of HENSIUS on comets is also included. A colored map of the northern hemisphere shows what lands in the far north were known in LOMONOSOV's time.

LOMONOSOV was one of the greatest figures in the history of chemistry. He set forth an atomic-molecular theory of matter some sixty years earlier than DALTON, foreseeing the possibility of isomers. He was the first to observe and describe frozen mercury and the first in Europe (1749) to establish a laboratory for the regular instruction of university students in practical chemistry by the laboratory method. His program for the study of the physico-chemical properties of solutions included a number of important points, viscosities, specific heats, etc., which have not even yet been sufficiently examined. Now that his works have been brought together, it is hoped that they will be studied and discussed in detail for the benefit of English-speaking students of the history of science. T. L. D.

Courtney Robert Hall.—*A Scientist in the Early Republic*, SAMUEL LATHAM MITCHELL. 1764-1831. New York, Columbia University Press, 1934. v+162 pages. Portrait. ($2.50).

This book is not a biography but is rather an account of the activities and influence of MITCHELL and of the times and environment in which they were exercised. A contribution to the history of the United States, it relates but little to political history; it concerns an interesting and many-sided man effective in the formative period of the intellectual development, in particular of the scientific development, of this country. MITCHELL 's greatness lay in the multiplicity of his scientific contacts, of the trains of thinking which he started among his contemporaries. He lived at a time when " it was still possible for a man to delve successfully into more than one branch of learning. It was, in fact, frequent that the more dispersed the delving, in that early age, the more probable the collision with significant truth." He was not a great chemist, but the book is one to which students of the history of American chemistry will wish to have access.

MITCHELL was born on Long Island, near Hempstead. He studied medicine at the University of Edinburgh, where BLACK and CULLEN were then professors, graduated in 1786 and afterwards made a tour of Europe. In 1792 the trustees of Columbia College in New York appointed him professor of " chemistry, natural philosophy, agriculture and the other arts depending thereon." He rendered essential service

in many ways to the state of New York and served in both houses of the national Congress. He was a polished orator and a facile writer of verse. He collected minerals, fossils, fishes, plants, and all sorts of natural curiosities, wrote on the geology of the United States, and made contributions to ichthyology, botany, and ethnology which time has shown to be significant and of greater importance than his contributions to chemistry. He was a member, active, corresponding, or honorary, of at least fifty scientific societys. His place in the history of chemistry rests mainly upon the facts 1.) that he founded (with two others) and edited (as Editor-in-Chief for twenty-five out of the twenty-seven years of its existence) the *Medical Repository*, the first medical journal in the country and an open meeting-place for the discussion of chemical and other scientific matters, 2.) that he published in 1801 a booklet on chemical nomenclature, based upon the usage of LAVOISIER's school but designed to reconcile that usage with the language and ideas of the phlogistonists, and 3.) that he was one of the first to use chemical tests as a basis for the classification of minerals. His theory that diseases were caused by *septon* (by which term he seems to have intended the lowest oxide of nitrogen) at least had the value that it brought about the general use of alkaline substances, soda, lime, soap, etc., for the washing of places where, as we now understand the matter, the contagion might really have lurked.

The book is clearly and neatly printed, and is well indexed. Five appendices contain interesting material, among other things MITCHELL's own versified exposition of the Doctrine of Septon and hitherto unpublished matter on the Lumachella Marble of New York and on the Illusions of the Human Senses. T. L. D.

Jean Destrez.—*La Pecia dans les manuscrits universitaires du XIII^e^ et du XIV^e^ siècle.* 2 vols. in large quarto : 104 pp. and Album de planches. Editions JACQUES VAUTRAIN, 46 Avenue de Breteuil, Paris 7^e^, 1935. (Price 275 frs. Album of Plates alone, 180 frs.)

The *pecia* is an important feature of many medieval manuscripts which appears to have passed unnoticed by scholars, cataloguers and paleographers until the present century. This is the first considerable work to appear on the subject, although preceded by some briefer articles of the same author and others. The two present volumes of text and plates are sumptuous and expensive, but the author plans a longer work in which he may give a fuller exposition of his extensive researches and substantiation of his findings. Their general nature and great importance are, however, well indicated in the present book and album.

The *pecia*, or piece, a name apparently at first applied to a skin or

sheet of parchment which could be folded twice to make eight pages, came to indicate a unit in copying the standard texts read and lectured upon at the universities, notably Paris and Bologna. For each text the university caused to be drawn up an authoritative original text or *exemplar* which was kept in small loose sections or *peciae* at the stationers' whence it might be borrowed one *pecia* at a time by masters, students or professional copyists who wished to make a copy of the text of their own. Thus almost as many copies of a work could be made simultaneously by different persons as there were *peciae* in the *exemplar*. The loose *peciae* of the original normally filled exactly eight double columned pages but the copying was generally done in a bound volume where one *pecia* might end and the next follow in the middle of a page. Often, however, the copyist gives the number of the *pecia* in the margin or, if he makes no intentional mark to indicate the transition, does so unintentionally by a slight change in the character of the writing caused by resharpening his goose quill and dipping it afresh into the ink upon returning from the stationer's with the next *pecia* and resuming writing.

In his researches into the subject M. DESTREZ has examined over 7000 manuscripts of the thirteenth and fourteenth centuries, of which over 1000 contain indications of *peciae* and thirty seem to be *exemplaria* or original texts. These manuscripts with the division into *peciae* represent over three hundred different works used as texts in the faculties of arts, medicine, law, and theology. Of the *Golden Legend* of JAMES OF VORAGINE alone M. DESTREZ examined 192 manuscripts, of which 21 contained indications of *peciae*. These twenty-one fell into at least six different groups or families, of which five represented as many Parisian originals or exemplars. For while DESTREZ holds that a given university had only one exemplar at a given time, they had to be renewed from time to time as parts were lost. There was a tendency for writing to spread over a greater space and the number of *peciae* constituting the exemplar to increase with successive renditions, so that M. DESTREZ regards it as a safe general rule that the exemplar consisting of the fewest *peciae* is the oldest.

The present work divides into three parts dealing respectively with the *pecia* as such and its importance for palaeography and for textual criticism. Evidently in those works in which it occurs it must be taken as a unit which has undergone its own vicissitudes, for a single *pecia corrupta* or *pecia falsa* may occur in a copy which otherwise faithfully reproduces the original or exemplar. Or there may be a number of such *peciae*. Then follows an appendix descriptive of the thirty-six fine plates reproducing specimen pages of manuscripts which constitute the *Album*.

This last may be purchased separately for use in courses in palaeography.

M. DESTREZ points out the difference between the production of manuscripts in monasteries, characteristic of the earlier period including the twelfth century, and their production at university centers from the thirteenth century on. For one thing, the format decreased in size, since the book was not to remain in a monastery but had to be handled and carried about by students who often took it from the university to their native towns. Thus manuscripts of Oxford were disseminated on the continent, and those of the university of Naples through the Italian peninsula. But their place of origin is evident, because each university had its own palaeographical characteristics. Furthermore the production of books was in large measure industrialized before the invention of printing; more copies were turned out and that more rapidly. Even the illuminators often worked under the direction of "un chef d'atelier."

Yet even under such circumstances they seem never to have executed their task servilely. "Ils y ajoutaient leur cachet personnel, leur esprit et, à l'occasion, leur grain de sel." Or elsewhere M. DESTREZ speaks of the world of copyists, both lay and cleric, that formed about a university, a turbulent crowd, "imbued with a spirit much too individualistic to adapt itself to work done in common." Thus his investigation, like so many others, testifies to the existence already in the middle ages of that spirit of individuality which some still claim as a new achievement of the Renaissance or modern times.

Many other matters are discussed in this book, which is full of precious indications for palaeographers and students of manuscripts: the kind of parchment used, the number of leaves per cahier, initials, miniatures and other ornamentation which, as M. DESTREZ points out, have hitherto been studied chiefly in unique copies de luxe intended for princes. The work is important for students of the history of science because works of ARISTOTLE in natural philosophy and standard texts in medicine were among those circulated in copies made by *peciae* from *exemplaria*, and also because of the new light which it throws upon life in the medieval universities. The author deserves the grateful acknowledgement of the world of scholarship for his prolonged, painstaking and enthusiastic research among the manuscripts, and for his very attractive presentation of these first-fruits of his labors. May the larger work which he envisages soon give us the full benefit of them!

The following misprints have been noted: p. 26, n. 1, *Satuten* for *Statuten*; p. 43, l. 9, *présentationi* for *présentation*; p. 48, n. 1, 1923 for 1823; p. 67, n. 1, 1296 for 1926.

Columbia University. LYNN THORNDIKE.

Liao Wên-Jên.—*Shina chûsei igaku shi* (History of Chinese medicine in the Middle Ages), 466 p., 1 facs. Kyoto, Kaniya shoten, 1932. (Y. 8.00.)

In the *Analects* CONFUCIUS writes : " A man without constancy will make neither a soothsayer nor a doctor." In its early stage the science of medicine was closely allied to witch-craft and superstition, and in spite of many references to the practice of medicine in the early records, it was shrouded in myth for twenty centuries or more.

The oldest medical treatise extant is *Su-wen* attributed to HUANG TI (26 centuries before Christ). Although such claim is discredited, one can safely assume that the work was written several centuries before Christ, and contains a summary of the traditional knowledge of medicine handed down from the ancient times. The *Shang-han-lun* is another important work, and it is no exaggeration to say that the medical science of the Han and pre-Han periods is summarized in these two works.

The medicine in the T'ang and Yüan dynasties was much influenced by newly introduced Buddhism and astrology as well as by divination, but in its more scientific aspects, the importation of Indian medicine contributed much toward therapeutics. In the 7th century China's contact with the Roman Orient as well as other Western nations introduced more innovations, and the author traces the evolution of the knowledge and methods of treatment of various diseases. In due time, the improved Chinese medicine was brought into Japan together with the Confucian ethical teachings. Hence the early Japanese physicians made serious attempts to cure not only physical but also spiritual ills.

The practice of medicine was defined by the government with greater or less precision at various epochs. There were nine to thirteen branches of medicine, depending on the period, and usually the examinations came once in three years. During the T'ang dynasty, the government chose a few able students to study medicine, and those who intended to go into general practice had to study seven years; into dermatology five; into the treatment of eyes, nose, and ears, four; and into other branches, three years. It is interesting to note that as early as the middle Han period, there were a few female physicians.

Chapter 8 gives a selected bibliography of medical works in the middle ages, and over 2300 titles are listed. The remaining section of the book takes each branch of medical science and narrates its development as well as the history of several important diseases.

The author is a native of Formosa and is executive secretary of the History of Medicine Society of Japan.

(Library of Congress.) SHIO SAKANISHI.

Jacob S. Minkin.—*The Romance of Hassidism.* VIII+398 pp. THE MACMILLAN CO. New York, 1935 (Price $3.50).

Around 1700 the spiritual life of the Jews reached a stage of stagnation and decay hardly equalled at any time of their history. This was the result of their deep degradation, social and economic. In the course of the eighteenth century, however, there arose two forces, pulling into opposite directions and deeply disturbing the static of the Orthodox Synagogue. The one was the movement of Enlightenment and Emancipation, headed by the hunchbacked philosopher of Berlin, MOSES MENDELSSOHN (1729-1786), and leading the way towards progress and Western civilization. The other one was the movement of Hassidism, founded by ISRAEL BAAL SHEM TOB, of Medziboz (1700-1760), and pointing backwards, representing a fall and retrogression into still more abysmal depths of ignorance and degeneration. Hassidism may be described as the revolt and mystic reaction on the part of the ignorant Jewish masses against the intellectual aristocracy and the strict legal discipline of the official orthodox creed.

Dr. MINKIN's book is the first history of the Hassidic movement written in English and presented with great love, understanding and ability. It is one of those rare books that combine instruction with entertainment. It is a scholarly work and a literary achievement. The author tells us the story of this romantic movement in the form of short but masterful biographical sketches of the outstanding first six teachers of the new doctrine.

The sect of Hassidism was born about two hundred years ago in the solitude of the primeval forests of the Carpathian Mountains, where its founder, ISRAEL BASHT, spent his early youth. BASHT was the seer and prophet of the movement. He liked to mingle with the plain folks, the villagers, illiterates and sinners. In the market place or in the Synagogue, he would seek their company, tell them his stories and parables, and sell them his amulets and wonder cures. He was opposed to the bookish learning of the Rabbis and rejected the ascetic and legalistic aspects of their religion. His message was : a new heart and a new life, a life of joy, love and warm emotion, inspired and ennobled by the new faith, by a closer communication with God through the ecstasy of prayer, song and dance.

Already BASHT accepted money from his adherents. With the growing host of his admirers great sums of money passed through his hands, but he distributed all he received among his disciples and the poor members of the community. He himself lived in poverty. His disciple and successor, DOB BAER (1710-1773), paid more attention to building up the financial and political side of the movement. He

became the organizer of the sect by further developing the idea of Zaddikism. The leader of the sect had to be worshipped as the Zaddik, the vicar of God upon earth, in whose power it was to perform all kinds of miracles and to function as the channel and medium, through whom the divine blessings and graces came to the host of the Hassidim. These in turn had to show their gratitude and worth by contributing rich gifts and by paying divine honors to their saint and hero. The institution of Zaddikism is the central idea of Hassidism, and it stamps the whole movement as a reversal to primitive, almost heathenisch superstitions and practices. On the other hand it created the organization, the machine, which gave the movement its power and stability.

In the beginning there was only the spoken word but no written literature. True to its primitive, or rather primitivistic nature, Hassidism relied entirely upon oral tradition. In the early times of Islam, when two Muslims met, it was customary that the one should ask for and the other should relate some story or saying of the Prophet MOHAMMED. Thus the oral tradition of Islam, the *Hadith*, grew up. A similar custom prevailed among the Hassidim. Whenever and wherever they met, those best qualified as story tellers would entertain the circle by telling them of the miracles and pious sayings of the Zaddik-Hero. Thus arose the legendary lore of the Hassidic sect. JACOB JOSEPH of Polona (d. 1782) was the first to introduce Hassidism into the Hebrew literature. He is characterized as the BOSWELL of BASHT and also as the fighter and polemicist, as the protagonist of the sect. In sharp contrast with him stood the gentle saint LEVI ISAAC of Berditchev (1740-1810). The characteristic feature of his teachings is a kind of sentimental nationalism, the deification of the race of Israel. To LEVI ISAAC the love of Israel stands above the love of God. The prophets castigated Israel because it sinned against God. LEVI ISAAC reasons with God, nay he almost censures Him, because He wronged Israel, the choice of the human race. Instances of somewhat similar tendencies are te bo found in the prophetic writings and in the later Agadah.

LEVI ISAAC's contemporary, SHENEUR ZALMAN of Ladi (1747-1812), is said to be the philosopher of Hassidism. He was the originator of the system of HaBaD. These are the initials of *Hokhmah*, *Binah*, *Deah*, meaning Wisdom, Reason and Knowledge. However, it must be realized that with SHENEUR ZALMAN these terms represent rather Cabbalistic speculations than the wisdom and reason of the philosophers and scientists. His Hassidic fancies about the ubiquity of God are much nearer to the thinking of the primitives than to the philosophy of SPINOZA. Like the rest of the Hassidic leaders, the so-called philosopher of Ladi was a bitter enemy of science and secular education. In the struggle between

Czar ALEXANDER and NAPOLEON, he sympathized with the Czar and organized the opposition to NAPOLEON, because he clearly recognized that a victory of the latter would mean the introduction of Western civilization and strike a deadly blow at Hassidism. So he not only preferred the poverty, ignorance and degrading oppression of the Czarist regime, but he actively organized the fight for its preservation and perpetuation (1).

Finally, NAHMAN OF BRATZLAV (1772-1811) is described by the author as the most sympathetic figure among the Hassidic teachers. He was a poet and mystic who took the office of his spiritual leadership very seriously. He raised the Zaddik to a kind of Super-Deity, but he neglected the business side of the institution. He wanted to be only a teacher and healer of the souls. Consequently, he lived in great poverty and was bitterly persecuted by the regulars of the guild of the Zaddikim, as he interfered with their business. NAHMAN OF BRATZLAV was great as a story teller, and transmitted all his teaching only by word of mouth; but he had a faithful disciple who served as his scribe and took down in writing all his stories and sayings.

On the whole MINKIN deserves great credit for his book. It is the fruit of hard and honest work, as the author appears to have made a thorough study of the literature on the subject. MINKIN is the first to humanize Hassidism and to interpret it to the English reading public, even as MARTIN BUBER did for the German public. In the reviewer's opinion, however, MINKIN's contribution is of much more historical value than BUBER's. The latter is a mystic and poet himself. Being a master of the phrase, he ends by becoming its slave; being a mystic, he very often becomes obscure and vague. MINKIN, too, betrays great sympathy and love for his subject, but he remains a clear thinker and honestly endeavors to make his vague and obscure subject clear and intelligible, to himself and to his readers.

And yet even in MINKIN's presentation the critical judgment is often affected by his love and enthusiasm. The apologist often overshadows the historian, the panegyrist prevails over the critic. The author's sense of the historical and cultural significance of the Hassidic movement is somewhat obscured by his nostalgia for the romance of its emotional life. While extolling the dynamic force of Hassidism and praising it as a religious renaissance, MINKIN seems to lose sight of the true, ugly nature of this reactionary movement. Let us suppose that Hassidism had carried a complete victory and had become the prevailing form of Jewish life and thought. Then, verily, instead of the modern

(1) See MINKIN's book, on p. 224.

Jew with universal interests, instead of the leader in science and industry and the fighter for social progress, we would have the type of the Eastern Hassid, living in the villages of the Carpathian Mountains, undertaking his annual pilgrimages to his Hero-leader, listening to the silly oracles of the Zaddik and performing his dry, angular dances to the tunes of the primitive Hassidic songs. MINKIN himself admits (p. 348) that a " good deal of the poverty, ignorance and superstition of the Jews in Poland is directly attributable to the cult of Zaddikism." But he is impressed by the fact that the movement did survive for about two centuries and did make partial conquests. Against this the reviewer would like to remind that it is not always the highest and noblest types that survive. It is rather the fittest, those best adapted to their environment. Mystic and reactionary movements will always appeal to the masses, and will always preach the " rebirth and revival " of some idea and ideal of the past. Besides, the masses are not swayed by the deep thinkers or noble characters, but by the unscrupulous demagogues and charlatans. SPINOZA (1632-1677) was excommunicated, while the charlatan SABBATAI ZEBI, (1626-1676) impersonating the Messiah, was crowned and deified. NAHMAN KROCHMAL (1785-1840), the real philosopher of the Polish Jews, died a poor and lonesome man, as a guest in the house of his daughter, while the Hassidic miracle workers cleaned up fortunes and lived in their mansions, surrounded by thousands of admirers.

Hassidism is only one form of the religious mysticism of the Jews. Thus ELIJAH WILNA (1720-1797), the most formidable opponent of the Hassidic sect, was himself an addict of the Cabbala, which latter one was a kind of aristocratic and academic mysticism. ELIJAH WILNA simply sat in his study, fasted and prayed and meditated, and, in addition to his critical Talmudic works and scientific treatises (2), wrote also cabbalistic glosses to the Bible. ISRAEL BASHT carried mysticism into the life of the plain people and adapted it to their primitive ideas and practical needs. Hassidism is the Cabbala of the plebeians. In a sense, early Christianity was also only a mystic reaction of the uneducated Galileans against the legalism and intellectualism of the Pharisees, who at that time had already become an aristocracy of scholars. Hence the sympathy of Christian mystics with Cabbala and Hassidism.

On the other hand, Jewish mysticism is only a special form of the general mystic movement common to all mankind. In order properly to understand and to evaluate the nature and rôle of Hassidism, it should be investigated in the light of similar phenomena to be found among

(2) On mathematics, astronomy and grammar.

all the races and at all the times. Common mysticism again may be explained as a special form of the still more general principle which the writer once formulated as " the Law of Gravitation in Moral Life " (3). Our present civilization consists of a series of layers of civilization, various strata of traditions, which are, so to say, piled up one upon the other. The nations, as well as the individuals, rise gradually, in the periods of their life, from the lower to the higher levels. It takes a great effort to climb up to the higher strata. It requires labour and causes pain. But to go downwards is easy and agreeable. It affords relaxation and pleasure. Hence the general tendency, of individuals as well as of whole communities, to revert to more primitive ideas, habits and ways of life of the old happy times. Hence also the widely spread phenomenon of the so-called " cultural primitivism, " (4) which consists in the " discontent of the civilized with civilization " and in " the belief of men living in a relatively highly evolved and complex cultural condition that a life far simpler and less sophisticated... is a more desirable life." In this form we call it a " back to nature movement." It implies, wrongly of course, that in primitive life there was more perfection, wisdom and happiness than in the state of civilization. In the political world we call this gravitational pull of primitivism reaction. In the realm of science we may also observe a constant tendency of a reversal to related primitive superstitions. This was especially the case during the early stages of scientific development. Thus the Pythagoreans tried to mix up arithmology or number mysticism with mathematics; astronomy had to compete with astrology, chemistry with alchemy, and medicine has always to battle against the inroads of medical quacks.

In like manner, the established Churches with their highly developed legalism and ritualism, with their bookish literature and learned priests, have always to fight against the onslaught of mystic movements which try to revive the primitive forms of religious life and tend to revert to its roots and origins. The only difference is that here, in the field of religion, the mystics seem to have indeed some justification. In religion there is no law of progress, but quite to the contray, a law of constant regression and decay. As civilization advances, religion degenerates. In the beginning, heaven is near to the earth, the gods are living and visible heroes, constantly in touch with their people. In the end, God disappears, and what remains are priests and scribes. At the fountain head, there is inspiration and revelation, prophetic vision, signs and

(3) In my still unpublished book on Oral Tradition, chap. II, § 5.

(4) See A. O. LOVEJOY and GEORGE BOAS, *A documentary history of primitivism.* Vol. I. *Primitivism... in antiquity*, Baltimore 1935, and compare also its review by SARTON, in *Isis* 25, 169-172.

miracles. At the end, the divine fire of the holy altar is extinguished. What remains are the embers of cold books and dry statutes; a blind obedience and a ritual servitude mitigated by sly evasion and hypocrisy. Religion in modern society ceases to be a living force and becomes an artificial convention. No wonder, therefore, that from time to time there rise prophets and mystics who, like ISRAEL BASHT, despise and hate all these dead books and dry formulas, who reject the authority of the scribes and go out to seek God himself and to find a new Revelation. What they usually find are only the old ghosts and spirits, survivals of the desert and relics of the primeval forests, creatures of the dark caves and misty jungles. The God who wills civilization and progress and whose message is justice and truth reveals himself in a different way to a different kind of prophets.

(New York.) SOLOMON GANDZ.

Fritz Lieben.—*Geschichte der physiologischen Chemie.* X+742 S. Leipzig und Wien, FRANZ DEUTICKE Verlag 1935. Preis Mk. 20; geb. Mk. 23.

Das Erscheinen eines ausführlichen Werkes über Geschichte der physiologischen Chemie wird an vielen Stellen Aufmerksamkeit erregen. Grosse Erfolge der neueren wissenschaftlichen Chemie liegen auf Gebieten, wo sie sich mit Physiologie trifft. So wird also nicht nur derjenige, der sich für die Geschichte der Wissenschaften interessiert, gern nach einem solchen Werk greifen, sondern auch derjenige, der einen Überblick über Zusammenhänge auf einem gegenwartswichtigen Gebiete der Forschung sucht. Da LIEBEN seinen Bericht mit der ältesten Zeit beginnt und bis in die Gegenwart fortführt, kann er beide Gruppen von Lesern fesseln. Wenn man allerdings nach Jahreszahlen rechnet, so überwiegt wohl die Darstellung der neuesten Ergebnisse, sodass sich das Buch auf langen Strecken wie eine Darstellung unserer heutigen physiologischen Chemie liest. Aber andrerseits ist doch in den letzten Jahren die Entwicklung dieser Wissenschaft so ausserordentlich rasch vor sich gegangen, dass man oft genug in heutigen Publikationen von Arbeiten aus dem Jahre 1930 als " vor längerer Zeit erschienen " lesen kann. Ob der Fortschritt auch weiterhin mit solcher Geschwindigkeit geschehen wird, bezweifelt LIEBEN auf Grund der allgemeinen Tendenzen, die sich in unserem Gemeinschaftsleben immer stärker bemerkbar machen, und dies scheint einer der Hauptanlässe zu sein, die LIEBEN zur Abfassung seines Werkes drängten. Er steht ganz auf der Seite der Wissenschaft und empfindet dies als einen Gegensatz zu gewissen allzumenschlichen Einstellungen, von denen aus Wissenschaft als etwas Minderwertiges betrachtet wird. Dies kommt in gelegentlichen, manch-

mal allzu bissigen Bemerkungen zwischen den verschiedenen Abschnitten des Buches zum Ausdruck.

Nimmt man das Entstehen dieses Buches selbst schon historisch, so ergibt sich, dass es nicht allein dem Fleiss, den keine Mühe bleichet, und der Fachkenntnis seine Entstehung verdankt, sondern dass auch ein starkes Temperament zur Planung und zum Durchhalten nötig waren. LIEBEN betont oft, dass die Auswahl und die Anordnung des Stoffes von ihm nicht durch allgemeine Grundsätze begründet werden können, sondern dass persönliches Interesse und Gefühl dabei wirkten. Dies befreit den Referenten natürlich nicht von der Pflicht, Auswahl und Anordnung seinerseits so gut er kann mit dem zu vergleichen, was er sich an allgemeinen Grundsätzen zu erwerben vermochte.

Das Buch ist in zwei sehr verschieden lange und auch verschieden wertige Abschnitte eingeteilt : Die ersten 96 Seiten behandeln die Entwicklung " bis zum 19. Jahrhundert," nämlich bis zu ARRHENIUS in einer hauptsächlich biographischen Darstellungsweise; die übrigen mehr als 600 Seiten sind als " Teil B " in 12 Kapitel eingeteilt. " Teil A " stellt im Wesentlichen einen Auszug aus bekannten Zusammenfassungen der Chemiegeschichte dar, wobei besonders das von BUGGE herausgegebene " Buch der grossen Chemiker " benutzt wurde : sicherlich eine sehr gute Quelle, deren allgemeine Zugänglichkeit es aber sehr fraglich erscheinen lässt, ob im Zusammenhang einer Geschichte der physiologischen Chemie ein solcher Auszug notwendig war. Dass er geschickt abgefasst ist, kann allein seine Notwendigkeit nicht genügend begründen. Der " Teil B " fusst im Wesentlichen auf den grossen Handbüchern der Physiologie, physiologischen Chemie und natürlich OPPENHEIMERS " Handbuch der Biochemie." Man wundert sich ein wenig, dass zuerst " Nahrung und Stoffwechsel " dargestellt werden, während Eiweiss, Kohlehydrate und Fett erst als 6., 7. und 8. Kapitel folgen. Dadurch werden oft Vorgriffe und Rückverweisungen nötig, die bei anderer Anordnung vielleicht zum Teil einer fliessenderen Darstellung hätten weichen können. Wie immer bei einer solchen nach Längsschnitten geordneten Darstellung entsteht der Wunsch, dass gelegentlich wenigstens auch ein querschnittartiger Überblick über die Unterstützung einer Sonderentwicklung durch die gleichzeitigen Errungenschaften auf Nebengebieten gezeigt würde. Gerade weil schon soviel Sammelarbeit in den grossen Handbüchern und Einzeldarstellungen vorlag, hätte eine noch souveränere Beherrschung des Stoffes auch etwas von der Dynamik der geschichtlichen Entwicklung aufzeigen können, und zwar anders als durch die Vorwürfe gegen VAN HELMONT und SYLVIUS (S. 99), die ein paar Seiten weiter (103) mit den Bemerkungen über den genialen SYLVIUS wieder aufgehoben werden müssen, oder

durch die gelegentlichen Lobpreisungen schon längst anerkannter Grössen, wie LIEBIG und EMIL FISCHER. Die Aneinanderreihung von Ergebnissen mit zugehörigen Jahreszahlen erfüllt noch nicht das Ideal einer Geschichtsschreibung.

Wenn man so kritisiert, so wünscht man doch gleichzeitig zum Ausdruck gebracht zu haben, dass man einen sehr hohen Massstab anlegt, und dass man sehr wohl weiss, wieviel leichter dies gegenüber dem fertig vorliegenden Buche ist, als während der ausgedehnten Arbeit zu seiner Komposition. In einer Darstellung, die direkt bis in die Gegenwart führen will, muss manches vorausgesetzt, statt abgeleitet und entwickelt werden. Dennoch hätte man wohl wünschen können, dass die Bedeutung der experimentellen Methoden und Wege stärker herausgestellt worden wäre. Auch für die Auswahl und Betonung könnte man Wünsche äussern, die in LIEBENS Buch nicht ganz erfüllt sind. Das ist natürlich bei der grossen Fülle des Stoffes, und es ist vielleicht auch nur wenig im Verhältnis zu dem Dargebotenen. Man unterhält sich darüber besser mit dem Verfasser allein.

Wesentlicher ist ein anderer für die Benutzung des Buches wichtiger Umstand : Wenn man einem solchen Werk nur ein kurzes Inhaltsverzeichnis beigibt, so ist es besonders wichtig, die Register gut auszustatten. Gewiss ist das mit viel Mühe verbunden und darf hier vielleicht als Wunsch für eine hoffentlich mögliche zweite Auflage darstehen.

Unter diesem Gesichtspunkt des Gebrauchswertes ist es recht wichtig zu erwähnen, dass das Buch fast frei von Druckfehlern ist; nur stört es, dass LIEBEN einige wenige Namen dauernd falsch schreibt, vor allem immer wieder CHEVREUL mit einem *i* vor dem letzten Buchstaben versieht.

Im ganzen muss man dem Verfasser und dem Verlag für dieses Werk dankbar sein. Was an Kritik auf den vorstehenden Zeilen gebracht wurde, entspringt diesem Gefühl der Dankbarkeit und will es durch Mithilfe an einer noch weiteren Verbesserung des Werkes zum Ausdruck bringen.

Heidelberg. EDUARD FÄRBER.

S. C. Gilfillan.—*The sociology of invention.* XIII+191 pp. Chicago, Follett Publishing Co., 1935. ($2.00).

Since the review of Dr. GILFILLAN's complementary volume, *Inventing the ship*, has already dealt with several theoretical issues developed in this book, our discussion will be confined to a few general considerations.

Upon the basis of twenty-five years of study, Dr. GILFILLAN has set forth 38 social principles of invention. These principles are all, on some level or other, useful guides for further research. They range from empiric summaries (" the perfecting of a type of object mechanically

is evidenced by its attainment of beauty") to analytical explanations (such as the exposition of relationships obtaining between population density and rates of invention). The basic value of these principles is the presentation of points of reference which suggest hypotheses amenable to verification; the essential limitation, if such it be, is that of inadequate historical perspective: they refer primarily to a particular cultural context, modern West-Europe. For example, a high population density in China, unaccompanied by intensive social interaction, is not associated with especial technologic inventiveness.

One might wish that Dr. GILFILLAN had treated more fully the covert influence of cultural values upon the rate of invention—a pervasive and deepseated influence which is only incidentally mentioned on pages 44-45. For rates of invention as a social manifestation and acts of invention as psychological moments are both organically linked with the ambient culture which provides motivation and instrument, ends and means. Only in a society which is integrated about the norms of utilitarianism and empiricism may we expect to find technologic innovation flourishing. For the essence of technology is utility—a rationally determined and pragmatically verifiable selection of means which is limited by the recalcitrance of nature and which is largely, if not completely, divorced from non-utilitarian symbolism (purely conventional or arbitrary relationships). But since the author deals primarily with invention in modern Western culture, perhaps this context is warrantably assumed.

Dr. GILFILLAN's volume constitutes a distinct advance in the sociological analysis of invention; it is by far the most systematic and painstaking work in the field. The author emphasizes rightly the arbitrary, purely linguistic criteria for distinguishing discrete inventions; develops fully the conception of innovation as an ongoing organic process; repudiates the widely accepted, but fallacious, view that technologic inventions diffuse more rapidly than cultural innovations; and indicates the essentially evaluative character of the popular cultural lag concept. Realizing the limitations of statistical studies of invention, he manages to utilize them to fullest theoretical advantage.

There is appended a classified, briefly annotated bibliography which is exceptionally useful, as well as five graphs of "cycles of invention" and patent statistics.

Harvard University. ROBERT K. MERTON.

Hermann Heinrich Ploss, Max Bartels, and **Paul Bartels.**—*Woman. An Historical Gynaecological Compendium.* Edited by ERIC JOHN DINGWALL. WILLIAM HEINEMANN (Medical Books) Ltd.,

London, 1935. 3 Volumes. Vol. 1, pp. XIII+655, Vol. II, pp. 820, Vol. III, pp. 543. 1002 Illustrations, 7 Plates. Price £ 8-8-0.

"*Ploss and Bartels*" represents a conjunction of names which for nearly half a century have served as the terms of reference to the great German compendium on the subject of woman in all her infinite variety, namely, *Das Weib in der Natur- und Völkerkunde*, which, first published in 1885 by PLOSS, and republished in an enlarged form by MAX BARTELS in 1887, and again subjected to a similar process in 1908 by PAUL BARTELS, and finally greatly enlarged and rewritten in 1927 by VON REITZENSTEIN, has now been translated into English and augmented by Dr. ERIC DINGWALL, whose interests in the field of sexual anthropology well qualify him for the immense task which he has so successfully brought to a conclusion in these three most excellently produced volumes. Since VON REITZENSTEIN's edition was the eleventh in the series of this work, the present, the first English edition, may be regarded as a twelfth edition of this famous work.

Ploss and Bartels never was a rigorously scientific treatise in the sense of being either systematic or exhaustive, or in the sense of expounding a particular thesis, rather, it was, and still remains, essentially a compilation, a series of summarized notes as the present editor says, drawn from both ancient and modern sources relating to every conceivable aspect to the life of woman, from the ovum to the grave. For this reason Dr. DINGWALL considers that the work is "thus rather of historical and cultural interest than of practical utility." Now, seeing that PLOSS and BARTELS, with all the limitations which must inevitably follow as a result of taking the whole world for one's province,—all times, all places, and all peoples,—does, nevertheless succeed in providing between the covers of a single work, the most exhaustive and fullest account of woman that we have, it were hardly credible, did we not know it to be untrue, that it was less of practical utility than of historical and cultural interest. Few who have delved deeply in the field of the Humanities during the last fifty years can have failed, at one time or another, to have gone to PLOSS and BARTELS for the information they needed on some point relating to womankind, and gone away again emptyhanded, even if they did not succeed in finding exactly what they were looking for; for it is true, that not everything relating to woman is to be found in PLOSS and BARTELS, not every detail of information, not every particle of knowledge that we possess concerning woman is to be found within its pages, but then, no one would be so foolhardy as to suppose that the subject of woman could be dealt with at all exhaustively in a little less than two thousand quarto pages! She, of whom it has been said that age cannot wither her nor custom stale her infinite variety, would

require a loose-leaf encyclopaedia of the dimensions of the Britannica to do her but adequate justice. Doubtless thoughts of some such nature led Dr. DINGWALL to make his remarks about the practical utility of the great work which through his own labours and enthusiasm he has now made available to the English-speaking world. Since the book is intended for sale by the publishers chiefly to members of the medical profession, anthropologists, gynaecologists, and other men of science, it is clearly proposed that the book shall be of practical utility to these classes of students, and the reviewer construes it to be his most important function in this connection to say, unequivocally, that *Ploss and Bartels* in its new English garb cannot fail to be a source of great practical utility, apart from its acknowledged cultural and historical interest, to anyone who may have occasion to consult it.

It would, of course, be an easy matter to point out any number of facts which the reviewer considers should have been included in the present text, and others which might well have been omitted, but then this is Dr. DINGWALL's edition of *Ploss and Bartels* and not the reviewer's. We all owe him a deep debt of gratitude for giving us an English version of an invaluable book,—but why, with such an excellent bibliography, were we not given an index?

Department of Anatomy
New York University. M. F. ASHLEY-MONTAGU.

Arthur O. Lovejoy; George Boas.—*A documentary history of primitivism and related ideas.* Volume I : Primitivism and related ideas in antiquity. With supplementary essays by W. F. ALBRIGHT and P.-E. DUMONT. XV+482 p. (Contributions to the history of primitivism). Baltimore, Johns Hopkins Press, 1935 (five dollars).

The historian of science is naturally interested in the idea of " progress," because in his own field, and in that field only, progress is something tangible. He cannot help meditating once in a while upon the broader issues : is that progress transmitted and transmissible to society as a whole? We have had various occasions of discussing this, e.g., apropos of the VIIIth International Congress of Sociology which met in Rome 1912 (*Isis* 2, 245), apropos of the late JOHN BAGNELL BURY (1861-1927) : *The idea of progress* (London, 1920, *Isis* 4, 373-5), and in my preface to volume XXI. Such discussions may not be useless but they are always disappointing because the necessary comparisons involve too many elements which cannot be properly measured. There is no means of measuring the happiness of people and their feelings of superiority or inferiority.

The editors of this collection : ARTHUR O. LOVEJOY, GILBERT CHINARD,

GEORGE BOAS, RONALD S. CRANE have had the excellent idea of attacking the subject in a very different way; instead of studying the idea of progress they are focussing their attention upon the competitive idea of regress. At all times there have been not only *laudatores temporis acti* (this is simply the natural result of old age regretting the golden days of youth) but people who believed that the world was going down from early days of innocence, happiness and perfection to future days of increasing sophistication, perversity and unhappiness. I have recently studied a very curious illustration of that tendency. The great sixteenth century mathematician SIMON STEVIN published in 1605 a long essay in which he defended the conception of an *eruditum seculum*, a mythical age of learning and wisdom (*Isis* 21, 259). This example is particularly startling because STEVIN was not, like his collaborator HUGO GROTIUS, a man of letters, but a physicist and engineer who cannot possibly have been unaware of the steady progress of science and technique. It is true that that progress was still slow and somewhat hesitating in his days; it was already accelerated but the acceleration had not yet continued long enough to be perceived.

The first volume of Prof. LOVEJOY's investigations is now in our hands. It deals with antiquity, and was quite a revelation to me. It made me realize firstly the complexity of primitivism; and secondly the antiquity of it in almost every one of its aspects.

To begin with, primitivism is a double concept.

> " It is a name for two distinct tendencies in human thought which appear to have had separate historic origins, but early began to fuse and interpenetrate. It is necessary, for any clear understanding of the phenomena with which we are to deal, to begin by distinguishing these tendencies. One of them we shall call ' chronological,' the other ' cultural ' primitivism. They are ways of thinking which, in spite of their usual association with one another, are primarily answers to different questions, which have in all periods presented themselves vaguely or definitely to men's minds ' (p. 1).
>
> " Chronological primitivism is one of the many answers which may be and have been given to the question : What is the temporal distribution of good, or value, in the history of mankind, or, more generally, in the entire history of the world ? It is, in short, a kind of philosophy of history, a theory, or a customary assumption, as to the time—past or present or future—at which the most excellent condition of human life, or the best state of the world in general, must be supposed to occur " (p. 1).

The editors analyze this idea and illustrate its possible forms, most of which have been realized in men's imagination. It would be too long to follow them; I shall simply reproduce their classification, the meaning of which can be understood without explanation by intelligent readers.

A. Finitist theories. I. Bilateral finitist theories (history has both a beginning and an end). 1. Theory of undulation. 2. Theory of decline. 3. The theory of ascent *(a)* continuous progress, *(b)* successive progress and decline. II. Unilateral finitist theories. B. Infinitist theories. 1. Theory of world-cycles. 2. Endless undulation.

" Cultural primitivism is the discontent of the civilized with civilization, or with some conspicuous and characteristic feature of it. It is the belief of men living in a relatively highly evolved and complex cultural condition that a life far simpler and less sophisticated in some or in all respects is a more desirable life. Its temper, when combined, as it very commonly has been, with chronological primitivism is summed up in the words of the Preacher, which, indeed, in the history of Judaism and Christianity seemed to give it a definite biblical sanction : " God hath made man upright; but they have sought out many devices " (p. 7)...

" The history of primitivism is in great part a phase of a larger historic tendency which is one of the strangest, most potent and most persistent factors in Western thought—the use of the term ' nature ' to express the standard of human values, the identification of the good with that which is ' natural ' or ' according to nature.' The primitive condition of mankind, or the life of ' savage ' peoples, has usually been extolled because it has been supposed to constitute ' the state of nature.' The phenomena to be exhibited in these volumes can not, therefore, be adequately comprehended without an understanding of the way in which this fashion of appealing to something called ' nature ' for norms came about, and of the extraordinary multiplicity of meanings latent in the term in its normative uses. Little, indeed, in the history of Western ideas about what is good or bad in conduct, in social and political institutions, and in art, is intelligible without a constant realization of the fact that the sacred word ' nature ' is probably the most equivocal in the vocabulary of the European peoples; that the range of connotation of the single term covers conceptions not only distinct but often absolutely antithetic to one another in their implications; and that the writers who have used it have usually been little aware of its equivocality and have at all times tended to slip unconsciously from one of its senses to another. A knowledge of the range of its meanings, and of the processes of thought—logical, pseudo-logical, or merely associative—by which one sense of it gives rise to, or easily passes over into, others—is an indispensable prerequisite for any discriminating reading of a large part of classical, medieval and modern literature and philosophy " (p. 11).

The present book contains many excellent contributions to the analysis and disentanglement of the ideas which are revealed and concealed by that potent and favorite shibboleth " Nature." See p. 11-16, 185-91, 447-56, and passim. In the pp. 445 ff. no less than sixty-six meanings of the word physis or nature are enumerated ! The study of these pages would be a good exercise in the understanding of " language."

This survey of primitivism and anti-primitivism in Greek and Latin literatures has been carried on with thoroughness and subtleness. Its reading will be very useful if only to fortify our humility, than which there is perhaps nothing which the " modern " man needs more. At

all times, even in the most ancient times penetrable to us, there have been men who looked up to a remote past as a golden age, and considered their own as decadent; at all times, even in those when life was as simple and crude as we can imagine, there were men who suffered from the complexities and superfluities of their existence, and thought that further complications would be utterly unbearable, and in short, that the world was going to the dogs. On the other hand, there were also people, fewer to be sure, who believed in what we would call progress. I was mistaken in saying that SENECA (1-2) was the first and only ancient writer who understood scientific progress (my *Introduction* 1, 248; 2, 484), for the idea was adumbrated more than once before his time.

Two very valuable appendices extend the survey to other fields : Ancient Western Asia by W. F. ALBRIGHT and India by P. E. DUMONT. They prove that those reflexions on the philosophy of history and the fate of humanity were not special to classical antiquity, but common to thinking men of many races. Let us hope that future volumes may contain similar surveys with regard to Egypt and China.

The book, I repeat, is excellent. It represents a most interesting cross section of ancient philosophy. It contains a large number of extracts, some of which are very long, in Greek or Latin, and also in English translation. The original texts have been omitted in the case of PLATO " in view of their general accessibility." But are the texts of the other famous authors of antiquity much less accessible, that is, to the scholars able and willing to read them? Of course not. This suggests my only criticism of the book. I don't like anthologies. It should be the purpose of a conscientious author to digest and assimilate all those texts so completely that he could give us their essence and would not oblige us to reexamine all the documents of the case. The anthology idea represents a perverse conception of " return to the sources. " Accessible sources should be clearly indicated of course, but replaced by a creative and organic synthesis. It is true that synthesis has been added in many cases, and the authors have made great and successful efforts to elucidate their story. Nevertheless the presence of such abundance of materials is more obstructive than useful.

Two other books of the same collection " Contributions to the history of primitivism " have been issued previously by the same publishers. LOIS WHITNEY : *Primitivism and the idea of progress in English popular literature of the eighteenth century;* and GEORGE BOAS : *The happy beast in French thought of the seventeenth century.* We did not see the former; the latter was twice reviewed in *Isis* 21, 377; 22, 240. We shall look forward with keen interest to the following volumes.

GEORGE SARTON.

James J. Walsh.—*Education of the Founding Fathers of the Republic*; Scholasticism in the Colonial Colleges; A Neglected Chapter in the History of American Education. Fordham University Press, New York, 1935. 377 pp., 7 illustrations.

In this book Dr. WALSH has brought to light, published and interpreted a number of the lists of graduation theses from early American colleges from the seventeenth to the early nineteenth century. He thus supplies further proof of the survival of medieval intellectual interests not only into early modern times but to within the last century, and in addition demonstrates the intellectual continuity of the American colonies with the universities and scholasticism of medieval Europe. A number of these theses sheets are reproduced in facsimile in their original Latin, and generous illustrative extracts from others are translated into English. These theses were grouped under different subjects such as grammar, rhetoric and logic—the old medieval trivium—or physics, ethics, metaphysics and theology, with sometimes politics, astronomy, mathematics and technology. Back of these Commencement theses lay a training in disputations like that of the medieval schools. Dr. WALSH contends that students in these American colleges did not spend their time chiefly on the classics, but were supposed, as in the case of the medieval European universities, to have learned to read and speak Latin in a grammar school or under private tutors before they entered college. Not only did the old method of instruction persist, but such scholastic concepts as ens, matter and form and privation, *materia prima* and *materia secunda*. The new doctrines and ideas of COPERNICUS, KEPLER and BOYLE also received recognition, however. It would have been interesting, if Dr. WALSH had traced in detail the persistence and passing of Aristotelian theory in these theses and their gradual inclusion of modern science and ideas. But perhaps the limited number of such theses extant would not have made this very feasible.

So much for what may be termed the strictly historical part of the volume and that based upon original research. In the rest of the book, with rather too profuse quotation from other writers from SAINTSBURY to Rev. Dr. BERNARD IDDINGS BELL, Dr. WALSH engages in glorification of medieval scholasticism and of the old method of instruction in the American college in the time of the founding fathers of the Constitution and Declaration of Independence. He especially stresses the beneficial effect upon mind and character of the course in ethics given by the president of the college. But when he writes (at page 337):

> The teachers themselves at medieval universities were all celibate by statute and gave an example of continence that was inspiring to the young men around

them so long as they too remained unmarried and yet was not in any way a discouragement of matrimony,

we must remind him of the criticism of universities in the thirteenth century by HUMBERT THE ROMAN or of the remarks by ALVARUS in his *De planctu ecclesiae* on the faults of scholars. The ninth fault is that

> On feast days they don't go to church to hear divine service and sermons and above all the full mass which all Christians are supposed to attend but gad about town with their fellows or attend lecture classes or write up their notes. Or if they go to church, it is not for worship, but to see the girls or swap stories.

The twelfth fault is that

> The expense money which they have from their parents or churches they spend on taverns, conviviality, games and other superfluities; and so they return home empty, without science, conscience or money.

Or a decision of BALDUS, the great legal authority of the closing fourteenth century, may be recalled. A householder who had leased his premises to students brought suit against them on the ground that they were committing a nuisance and lowering the value of the property by bringing prostitutes into the house. BALDUS, however, held that the complainant had no case, since he should have known beforehand that this would happen. In another case BALDUS affirmed that the mere fact that students visited her house by day and night was enough to prove a woman a prostitute, and he added that, if a student went up to speak to a woman on the street, you could be sure that he was not repeating a Paternoster to her.

Columbia University, LYNN THORNDIKE.
New York, U.S.A.

Herbert Thoms.—*Classical Contributions to Obstetrics and Gynecology.* With a Foreword by HOWARD A. KELLEY. XXIII+265 pp. Illustrated. CHARLES C. THOMAS, Springfield, Illinois, 1935 (Price $4.00).

This volume is the latest to be published in the series of selected readings in the history of medicine which are being put out by the house of Mr. CHARLES THOMAS. In the present volume, which is devoted to the history of obstetrics and gynecology, Dr. THOMS has made his selections according to his own taste, and has mercifully not allowed himself to be intimidated by the "five-foot-shelf-of-books" principle in making his selections. The result is an eminently readable and, since it is chiefly intended for a student audience, stimulating book. The volume, however, is in no sense to be regarded as an historical study, it represents merely an historical conspectus of its subject, and no more than that is claimed for it.

There are altogether fifty-seven authors selected for quotation, from the Ancients up to the end of the nineteenth century, and to each of

the excerpts quoted from his authors Dr. THOMAS has devoted a short biographical sketch. These sketches are often more interesting than the selections themselves, and this, perhaps, is as it should be, for men should be more interesting than their discoveries, however interesting the latter may be. It is not surprising to learn, from these brief introductory accounts of the men, with what antagonism the great discoveries of many of these men were received by their colleagues. Thus, for example, the brilliant eassay of OLIVER WENDELL HOLMES (1809-1894) on *The Contagiousness of Puerperal Fever*, which first appeared in 1843, in which HOLMES gave evidence of having recognized the microbic origin of the disease, and warned physicians against acting as transmitters of the disease themselves, met with nothing but disapproval from the profession.

A far more tragic example is the case of one of the greatest benefactors of mankind of all time, IGNAZ PHILLIP SEMMELWEIS (1818-1865) who in 1847 successfully proved to himself that puerperal fever was a contagious disease and that it could be altogether eliminated by eliminating the possibilities of contagion. Acting upon this theory, in two years he had reduced the maternal mortality rate of parturient women from 16 per cent to 1.27 per cent in the Viennese Clinic presided over by JOHANN KLEIN. But the latter's vanity and jealously finally succeeded in driving SEMMELWEISS from the clinic and from Vienna. In 1860 SEMMELWEISS published his now famous, but then derided work, *Die Aetiologie, der Begriff und die Prophylaxis des Kindbettfiebers*; and less than five years later, as a result of the bitter opposition which he had to endure, his mind gave way, and he was forced to enter an asylum where, less than a month after his admission he died from the effects of a dissection wound sustained some weeks earlier.

The general antagonism aroused by JAMES YOUNG SIMPSON's (1811-1870) discovery of the anaesthetic uses of chloroform in 1847, and the antagonism exhibited towards EMIL NOEGGERATH's (1827-1895) discovery and description of latent gonorrhea and is effects, in 1876, are other cases in point... We are, I think, a great deal more tolerant to-day, and this, perhaps, is the best measure of the progress we have made since the last of these men wrote.

There is a good short bibliography of sources and an index. The book is very well bound and printed, and I have noticed but three minor misprints, the spelling " peritonaeum ' for ' peritoneum ' on pp. 3 and 4, " exterpating " for " extirpating " on p. 340, and " 1930 " for " 1830 " on p. 224.

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New York University.

Forty-fifth Critical Bibliography

of the

History and Philosophy of Science and of the History of Civilization

(*to December* 1935)

This forty-fifth Bibliography contains about 800 items. They have been kindly contributed by the 12 following scholars belonging to 3 different countries :

C. W. Adams (Hertford, England)
G. H. Chase (Cambridge, Mass.)
T. L. Davis (Cambridge, Mass.)
S. Gandz (New York)
C. A. Kofoid (Berkeley, Cal.)
C. D. Leake (San Francisco, Cal.)
R. K. Merton (Cambridge, Mass.)
J. Pelseneer (Brussels)
A. Pogo (Washington, D.C.)
S. Sakanishi (Washington, D.C.)
G. Sarton (Cambridge, Mass.)
M. E. Weeks (Lawrence, Kans.).

This Bibliography includes as usual a series of addenda and errata to Sarton's *Introduction to the History of Science*, vols. 1 and 2 (Baltimore and London, 1927 and 1931). Its purpose and methods have been explained in the preface to the thirty-eighth Critical Bibliography (*Isis* 20, 506-08).

I have in my drawers a large number of notes which I will be glad to publish as soon as I have been able to check them upon the originals.

I entreat the authors of relevant books and papers to send me copies of them *as promptly as possible* in order that their studies may be registered in this bibliography and eventually reviewed and discussed. By so doing they will not simply help me and every other historian of science but they will help themselves in the best manner for they will obtain for their work the most valuable publicity and its certain incorporation into the literature of the subject.

Many of the notes were checked and the final manuscript and proofs of this Critical Bibliography were kindly read by Dr. M. C. Welborn.

Harvard Library 185
Cambridge, Mass.

George Sarton
35.12.24.

PART I

FUNDAMENTAL CLASSIFICATION (CENTURIAL)

IXth Century B.C.

Allen, Thomas William. The Homeric scholia. *Proceedings of the British Academy* 17, 179-207, 1 facs., 1931. ISIS

VIIth Century B.C.

Herzfeld, Ernst. The traditional date of ZOROASTER. *Oriental studies in honour of Cursetji Erachji Pavry*, 132-36, 1933. ISIS

"The traditional date, which fixes the birth of ZOROASTER 258 years B. AL., 570 B. C., or 910 B. Y., is a true historical date, preserved by a favourable chance, through the author of the *Bundahishn*, who himself no longer could interpret its real meaning, and that great historian AL-BERUNI."

Lehmann-Haupt, C. F. Wann lebte ZARATHUSTRA? *Oriental studies in honour of Cursetji Erachji Pavry*, 251-80, 1933. ISIS

VIth Century B.C.

Rey, Abel. La pensée scientifique et le système du monde depuis le VI^e^ siècle jusqu'à la fin du V^e^. *Thalès* 1, 31-41, 1935. ISIS

Vth Century B.C.

Deichgräber, Karl. Zu Hippokrates' *περὶ ἀρχαίης ἰητρικῆς*. *Hermes* 68, 356-58, 1933. ISIS

Diller, Hans. Wanderartz und Aitiologe. Studien zur hippokratischen Schrift *περὶ ἀέρων ὑδάτων τόπων*. (*Philologus Supplementband* 26, H.E) Leipzig, DIETER, 1935. ISIS

Dumortier, Jean. Le vocabulaire médical d'ESCHYLE et les écrits hippocratiques. Paris, Collection BUDÉ, 1935. ISIS

Reviewed by MARCEL FOSSEYEUX, *Bull. de la société française d'histoire de la médecine*, 29, 238, 1935.

Grosskinsky, A. Zu HERODOTS periegese Libyens. *Hermes* 66, 362-67, 1931. ISIS

Kroll, Wilhelm. BOLOS und DEMOKRITOS. *Hermes* 69, 228-32, 1934. ISIS

Langerbeck, Herman. *Δόξις ἐπιρυσμίη.* Studien zu DEMOKRITS Ethik und Erkenntnislehre. 132 p. (*Neue philol. Untersuchgn.*, 10. H.). Berlin, WEIDMANN, 1935. ISIS

Reviewed by WILHELM NESTLE, *DLZ*, 6, 1327-31, 1935.

Philippson, Robert. Democritea. *Hermes* 64, 167-83, 1929. ISIS

1. DEMOKRIT als Homerausleger; 2. DEMOKRIT als Mathematiker.

Powell, J. Enoch. Die Quelle des Râ bei HERODOT. *Hermes* 69, 107-11, 1934. ISIS

Powell, J. Enoch. Das Niltal bei HERODOT. *Hermes* 68, 123-26, 1933. ISIS

Rome, A. PINDARE ou KIRCHER? *Les études classiques* 4, 337-50, 1935. ISIS

"M. PAUL FRIEDLÄNDER a récemment essayé de prouver que nous possédions bel et bien une mélodie antique sur la première Pythique de PINDARE. Travail fouillé, plein de remarques intéressantes. Nous ne demandons pas mieux que de revenir aux jours où nous admettions l'authenticité. *Sed adiuva incredulitatem.* Voyons donc quels sont les adjuvants d'incrédulité fournis par l'érudit auteur."

Walter, George. *περὶ γυναικειων ά* of the Corpus Hippocraticum in a mediaeval translation (Cod. Leninopolitanus Lat. F. v. VI 3 fol. 9). *Bulletin of the institute of the history of medicine* 3, 599-606, 1935. ISIS

IVth Century B.C. (whole and first half)

Bidez, J. Les couleurs des planètes dans le mythe d'Er au livre X de la République de PLATON. Académie royale de Belgique, *Bulletin de la classe des lettres* 21, 257-77, 1935. ISIS

Colin, Gaston. XÉNOPHON historien d'après le livre II des Helléniques (*Hiver* 406-5 à 401-0). 118 p. Paris, 1933. ISIS

Reviewed by A. PUECH, *Journal des savants*, 128, 1935.

Colin, Gaston. Sur la véracité de XÉNOPHON dans les "Helléniques." *Académie des inscriptions*, Comptes rendus, 343-49, 1931. ISIS

" Dans le genre historique, ses qualités trouvent mieux leur emploi dans l'*Anabase*, ou même dans la *Cyropédie;* et, en songeant à l'ensemble de son œuvre, on peut garder, comme je l'ai dit autrefois, de la sympathie pour cet homme qui représente assez bien ' l'Athénien moyen,' et, mieux encore, ' l'honnête homme ' du IV^e^ siècle."

Diès, l'Abbé. Le nombre nuptial de PLATON (Rép. 546). *Académie des inscriptions et belles-lettres*, Comptes rendus, 228-35, 1933. ISIS

Schuhl, Pierre-Maxime. PLATON et l'art de son temps. 123 p. Paris, ALCAN, 1933. ISIS

In this well written and fully documented essay the writer discusses the large number of passages in PLATO that deal with the arts. These have to do especially with sculpture and painting, but architecture and the drama are also touched upon. The critical and unsympathetic attitude of the philosopher is traced directly to the changes that were taking place in contemporary art, which were all in the direction of a more " illusionistic " treatment than that of earlier times. In sculpture EUPHRANOR, PRAXITELES, and LYSIPPUS (whose early works PLATO might well have seen), in painting APOLLODORUS, ZEUXIS, and PARRHASIUS were the protagonists of the new movement. PLATO's position is to be explained partly by conservatism and aversion to change, but even more by his fear of the upsetting effect of the new theories. In the new movement he saw analogies to the word juggling of the sophists which he so constantly condemns.

This brief summary does but scant justice to a work which throughout shows the hand of a scholar who has taken into consideration the opinions of earlier critics, but offers his own judgments and states them accurately and concisely. Eight brief appendixes devoted to the fuller discussion of matters touched upon in the text, and full and careful indexes add greatly to the usefulness of the book. GEORGE H. CHASE.

IVth Century B.C. (second half)

Becker, Albrecht. Zwei Beispiele für Interpolationen im ARISTOTELES-Text. *Hermeneutik* 13. 22*b* 38-23*a* 26 und *Metaph.* θ4. 1047*b* 14-30. *Hermes* 69, 444-50, 1934. ISIS

Gadamer, Hans Georg. Der aristotelische Protreptikos und die Entwicklungsgeschichtliche Betrachtung der aristotelischen Ethik. *Hermes* 63, 138-64, 1928. ISIS

Gohlke, Paul. Untersuchungen zur Topik des ARISTOTELES. *Hermes* 63, 457-79, 1928. ISIS

Hett, Walter Stanley. ARISTOTLE, On the soul, Parva naturalia, On breath. With an English translation. XII+519 p. Cambridge, Mass. Harvard University Press, 1935 ($2.50). ISIS

This recent volume in the Loeb Classical Library includes three minor and less generally known works of ARISTOTLE treating of subjects now classified in the fields of psychology and physiology although not written in or translatable into either the terminology or form of these sciences as now developed. They are speculative, at the most merely observational, never experimental. The translator characterizes these treatises as sometimes lucid and bald, sometimes involved and obscure, sometimes even unintelligible, and rarely brilliant. CICERO called them *commentarii* and the translator hints that they may be only lecture notes of the great philosopher or even of his pupils, perhaps emended by the bookworm APELLICON who is reputed by STRABO to have filled in gaps in ARISTOTLE's manuscripts caused by damp and moth " not well."

Perhaps also some of the present defects arose in the editing of these manuscripts by inferior clerks in Rome. The text is that of BEKKER based on the Paris and Vatican codices. Later critical alterations have been incorporated where they serve to clarify obscure passages. A glossary of ARISTOTLE's basic terms is furnished and each treatise is provided with an introduction and an analysis of the argument. C. A. K.

Jaeger, Werner. ARISTOTLE. Fundamentals of the history of his development. Translated with the author's corrections and additions by RICHARD ROBINSON. VII+410 p. Oxford, Clarendon Press, 1934. ISIS

Reviewed by CHARLES A. KOFOID, *Isis*, 23, 260, 1935.

Kalthoff, Paul. Das Gesundheitswesen bei ARISTOTELES. XVI+372 p. Bonn, DUEMMLER, 1934. ISIS

Reviewed by A. CASTIGLIONI, *Rivista di storia delle scienze mediche e naturali*, 26, 94, 1935; by ALDO MIELI, *Archeion*, 17, 98, 1935.

Karpp, Heinrich. Die Schrift des ARISTOTELES περὶ ἰδεῶν. *Hermes* 68, 384-91, 1933. ISIS

Regenbogen, Otto. THEOPHRAST-Studien I Zur Analyse der *Historia plantarum*. *Hermes* 69, 75-105, 190-203, 1934. ISIS.

Tarn, W. W. ALEXANDER the Great and the unity of mankind. *Proceedings of the British Academy* 19, 123-66, 1933. ISIS

Theiler, Willy. Die grosse Ethik und die Ethiken des ARISTOTELES. *Hermes* 69, 353-79, 1934. ISIS

Zoubov, V. ARISTOTLE's *Physics* in the old Russian literature. *Bulletin of the Russian Academy of Sciences*, section of social sciences, p. 635-52, 1934 (in Russian). ISIS

IIIrd Century B.C. (whole and first half)

Asín Palacios, Miguel. Nuevos datos sobre el Faro de Alejandría. *Al-Andalus* 3, 185-93, 1935. ISIS

Asín Palacios, Miguel. The Pharos of Alexandria. Summary of an essay in Spanish, with architectural commentary by M. LOPEZ OTERO. *Proceedings of the British Academy* 19, 277-92, 4 pl., 1933. ISIS

Enriques, Federigo. Gli Elementi d'EUCLIDE e la critica antica e moderna. 3 vols., I. (Books I-IV), 323 p.; II. (Books V-IX), 356 p.; III. (Book X), 337 p. Rome, 1925; Bologna, 1930-32. ISIS

Reviewed by DAVID EUGENE SMITH, *American mathematical monthly*, 42, 442-43, 1935.

IIIrd Century B.C. (second half)

Dubs, Homer H. The conjunction of May 205 B.C. *Journal of the American oriental society* 55, 310-13, 1935. ISIS

IInd Century B.C. (second half)

Bates, M.S. Problems of rivers and canals under HAN WU TI (140-87 B.C.). *Journal of the American oriental society* 55, 303-06, 1935. ISIS

Ist Century B.C. (whole and first half)

Frank, Tenney. CICERO. *Proceedings of the British Academy* 18, 111-34, 1932. ISIS

Hadzsits, George Depue. LUCRETIUS and his influence. VIII+372 p. New York, LONGMANS, GREEN, 1935. ($2.25). ISIS

This is the twelfth volume of the series " Our debt to Greece and Rome " by one of its editors. The account of the life of LUCRETIUS is of necessity brief for little is known of his social status, private and public life, and his personal appearance, barring one reputed likeness on agate. The author is sceptical of JEROME's statement of the insanity of LUCRETIUS due to a love-philtre, and of his subsequent suicide. The author reviews Epicurean philosophy in Athens and Rome. There is evidence that *De rerum natura* is woven into the fabric of VIRGIL's verse, influenced the *Satires* of HORACE, was held in high esteem by OVID, and was known to, but never quoted by CICERO who had a deep-seated opposition to the Epicurean School. He

summarizes the attitude of LUCRETIUS on the atom, the soul, religion and ethics and traces his influence in the Roman Empire, Middle Ages, the Renaissance, 17th and 18th centuries, and the present. His defense and exposition of atomism placed LUCRETIUS at the head of the Roman world as a scientist and related him to an age 1600 years after his time. He had a vision of a limitless universe, and of a vast natural experimental laboratory in which atoms were ever making infinite combinations and eventually creating the true and more permanent inorganic and organic worlds in a crude but genuine process of evolution. There was fermenting in his mind the fierce struggle for existence and the ultimate survival of the fit. His three Fates were heredity, environment, and function. Modern anthropology has confirmed his hypothetical primitive man and his belief in the evolution of religious thought. HAECKEL's monistic philosophy affirms the essential conclusion of this great Roman. C. A. K.

Hammer-Jensen, Ingeborg. Die heronische Frage. *Hermes* 63, 34-47, 1928. ISIS

Opperman, Hans. Zu den geographischen Exkursen in CAESARS *Bellum Gallicum*. *Hermes* 68, 182-95, 1933. ISIS

Ist Century B.C. (second half)

Cambridge ancient history. Edited by S. A. COOK, F. E. ADCOCK, and M. P. CHARLESWORTH. Volume X, The Augustan empire, 44 B.C.-A.D. 70. Volume of plates, IV, prepared by C. T. SELTMAN. XXXII+1057 p.; XIV+210 p. New York, MACMILLAN, 1934. ISIS

Reviewed by FRANK BURR MARSH, *American historical review*, 40, 721-23, 1935.

Mackail, John William. VIRGIL. *Proceedings of the British Academy* 17, 55-74, 1931. ISIS

Ist Century (second half)

Axelson, Bertil. Senecastudien. Kritische Bemerkungen zu SENECAS *Naturales quaestiones*. *Lunds Universitets Årsskrift* 29, VIII+119 p., LUND, 1933. ISIS

"Die romische Prosaliteratur enthält vielleicht kein Schriftstück eines wirklich bedeutenden Autors, das einer kritischen Bearbeitung so dringend bedarf wie SENECAS schlecht überlieferte und schlecht herausgegebene *Naturales Quaestiones*. Die vorliegende Arbeit, die zur Erzielung eines authentischen Textes beizutragen sucht, dürfte demgemäss kaum eine besondere Entschuldigung nötig haben."

Collum, Vera Christina C. The tressé iron-age megalithic monument

(Sir Robert Mond's excavation). Its quadruple sculptured breasts and their relation to the Mothergoddess cosmic cult. xi+123 p., 35 pl., 14 fig. Oxford, University Press, 1935. ISIS

Gunther, Robert T. The Greek herbal of Dioscorides, illustrated by a Byzantine A.D. 512, Englished by John Goodyer A.D. 1655, edited and first printed A.D. 1933. xii+701 p., 396 illustr. Oxford, University Press, 1934. ISIS

Reviewed by Charles A. Kofoid, *Isis*, 23, 261-62, 1935.

Kroll, W. Plinius und die Chaldäer. *Hermes* 65, 1-13, 1930. ISIS

IInd Century (whole and first half)

Johnston, Edward Hamilton. The Saundarananda or Nanda the Fair. Translated from the original Sanskrit of Aśvaghosha. xii+123 p. (Panjab University oriental publication no. 14). London, Oxford University Press, 1932. ISIS

Reviewed by F. Otto Schrader, *OLZ*, 38, 456-57, 1935.

Partington, J. R. An ancient Chinese treatise on alchemy. *Nature* 136, 287-88, 1935. ISIS

Apropos of the *Ts'an t'ung ch'i* of Wei Po-yang published by Lu-ch'iang Wu and T. L. Davis in *Isis* 18, 210-89, 1932 G. S.

IInd Century (second half)

Cumont, Franz. Les " Prognostica de decubitu " attribués à Galien. *Bulletin de l'Institut historique belge de Rome* 15, 119-31, 1935. ISIS

" Cet opuscule d' ' iatromathématique ' indique quels pronostics sur la durée et l'issue de la maladie il faut, le jour où le patient s'alite, tirer de l'aspect de la lune, grande régulatrice des fonctions du corps, de sa position dans le zodiaque, de ses rapports, dans chacun des douze signes, avec les planètes propices ou funestes. Bien que Galien n'ait point échappé entièrement à l'ascendant que, de son temps, les doctrines astrologiques exerçaient sur presque tous les esprits, il n'a jamais prétendu fixer le sort des malades par un diagnostic établi uniquement d'après l'observation du ciel, et l'on a jugé avec raison cette élucubration indigne du grand praticien et théoricien de l'âge des Antonins. Mais cette production singulière n'en garde pas moins son intérêt pour l'histoire des théories médicales, et sa valeur s'accroît de ce qu'elle contient deux citations, l'une d'Hippocrate, qui ne s'est pas retrouvée parmi les œuvres attribuées à celui-ci, l'autre de Dioclès de Carystos, le plus célèbre représentant de l'école dogmatique du IVe siècle, dont les écrits sont perdus." " En résumé, que sont donc les morceaux réunis dans le *Laurentianus* sous le nom erroné de Galien ?

Une série d'extraits d'un ouvrage étendu d'astrologie médicale, certainement antérieur au médecin de Pergame : les doctrines astrologiques qu'il reproduit sont anciennes et les noms donnés aux planètes sont ceux qui furent employés à l'époque hellénistique." " Cette œuvre ne peut être postérieure au I^er^ siècle de notre ère : elle appartient peut-être encore à la période ptolémaïque. Elle reproduisait—ce résultat des recherches de HEEG reste acquis—les doctrines de cette 'iatromathématique' égyptienne qui fut exposée en grec à partir du II^e^ siècle avant J.-C. sous les noms empruntés de PÉTOSIRIS-NÉCHEPSO ou d'HERMÈS TRISMÉGISTE. Le médecin qui rédigea ce livre, en grande partie perdu, était un adepte convaincu de cette divination astrale, dont il s'est fait le prédicateur. Il est persuadé que toutes les parties du monde sont unies par une 'sympathie réciproque,' qui met le cours des maladies en rapport avec celui des corps célestes. Il a une foi aveugle dans cette pseudo-science et croît à l'infaillibilité de ses méthodes."

Diller, Hans. Zur Hippokratesauffassung des GALEN. *Hermes* 68, 167-81, 1933. ISIS

Pfaff, F. RUFUS aus Samaria, Hippokrateskommentator und Quelle GALENS. *Hermes* 67, 356-59, 1932. ISIS

Pfister, R. Textiles de Palmyre. Découverts par le service des antiquités du Haut-Commissariat de la République française dans la Nécropole de Palmyre. 76 p., 13 pl., 21 fig. Paris, Les éditions d'art et d'histoire, 1934. ISIS

Les textiles découverts dans deux tombeaux de Palmyre comblent une lacune qui est bien définie comme suit " Nos connaissances des textiles gréco-orientaux sont très fragmentaires. En dehors de quelques tissus trouvés en Crimée et récemment à Doura-Europos sur l'Euphrate, nous sommes dans l'ignorance complète des étoffes fabriquées vers le début de notre ère et dans les premiers trois siècles après J.-C. L'Égypte elle-même, dont le sol est si propice à la conservation des textiles et qui, à partir de 250, nous a documentés d'une façon si abondante sur cette question, est muette pour l'époque qui nous intéresse aujourd'hui et qui embrasse les deux cents années précédant immédiatement l'extraordinaire floraison que pour l'Égypte on réunit communément sous le vocable 'copte'." (p. 7). Les textiles trouvés à Doura datent surtout du début du III^e^ siècle et sont des étoffes d'un usage courant. " A Palmyre, au contraire, nous rencontrons une richesse de matières et une variété de types inconnues jusqu'à présent. Cette richesse est évidemment due à l'opulence des deux tombeaux fouillés, mais elle résulte aussi de l'importance de Palmyre pour le commerce de l'Orient. Nous trouvons pour la première fois la pourpre véritable employée à profusion alors qu'elle n'existe ni à Doura ni dans la production très abondante de l'Égypte copte. La pourpre a été employée presqu'exclusivement pour teindre la laine..." " La technique des toiles et aussi des étoffes de laine est bien plus raffinée en Syrie que par la suite dans l'Égypte copte. Cette technique de Syrie se rapproche au contraire beaucoup de celle de l'Égypte pharaonique. Cela confirme la disparition complète des traditions égyptiennes à l'époque romaine, phénomène qu'on peut constater dans

tout l'art de l'Égypte. Alors que cet art profite largement des apports grecs, il ignore à peu près tout de l'Égypte pharaonique." Les soies chinoises trouvées à Palmyre " sont les premières trouvées dans le Proche-Orient (abstraction faite de celle découverte à Kertch); elles sont les premiers témoins en Occident du commerce d'exportation de la Chine des Han. Ainsi que RODON Y FONT l'a fait remarquer les tissus de soie fabriqués sous les Han démontrent que les Chinois de cette époque disposaient d'un métier mécanique perfectionné; ils étaient donc très en avance sur l'Occident, car, de ce côté, nous n'avons absolument rien à comparer à ces belles pièces." Le mémoire de PFISTER contient beaucoup d'autres faits intéressants concernant la pourpre de Murex, l'emploi de fils d'or, l'usage de laines naturellement colorées, les soies sauvages, etc. Il est admirablement illustré. Voyez le compte rendu d'un autre mémoire de PFISTER (Prague 1935) dans notre section " Greece." G. S.

Temkin, Owsei. Studies on late Alexandrian medicine. I. Alexandrian commentaries on GALEN's *De sectis ad introducendos*. *Bulletin of the institute of the history of medicine* 3, 405-30, 1935. ISIS

Walsh, Joseph. GALEN's writings and influences inspiring them. *Annals of medical history* 7, 428-37, 3 fig., 1935 (to be cont'd). ISIS

Walzer, Richard. GALENS Schrift " Über die Siebenmonatskinder." *Rivista degli Studi Orientali* 323-57, Rome 1935. ISIS

Text of the *περὶ τῶν ἑπταμήνων βρεφῶν*, together with Arabic and German translations and a 12 p. introduction. G. S.

Wellmann, M. Zu GALEN. *Hermes* 62, 493, 1927. ISIS

Wenkebach, Ernst. GALEN's Protreptikosfragment (Griechisch und deutsch). *Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* 4, H. 3, 88-121, 1935. ISIS

IIIrd Century (whole and first half)

Gossen, Hans. Die Tiernamen in ĂLIANS 17 Büchern *περὶ ζῴων*. *Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* 4, H. 3, 128-88, 1935. ISIS

Uhden, Richard. Bemerkungen zu dem römischen Kartenfragment von Dura Europos. *Hermes* 67, 117-25, 1 fig., 1932. ISIS

IVth Century (whole and first half)

Maurice, Jules. La terreur de la magie au IV^{e} siècle. *Académie des inscriptions*, Comptes rendus, 182-88, 1926. ISIS

« En résumé, de 313 à 390 pendant trois quarts de siècle après l'Édit de Milan, la liberté religieuse règna dans l'empire. On pouvait être païen et parvenir aux plus hauts postes, mais la terreur de la Magie règnait. Une accusation de ce chef était une condamnation. Lorsqu'en 391, 392, 393, 394 le paganisme fut banni de l'empire, défendu par des lois, la Magie rejoignit le paganisme sous le nom alors généralisé de *Superstitio*, et chose remarquable la pénalité s'adoucit. L'exil, la déportation, la confiscation, la perte du droit de tester remplacèrent la torture, le feu et les peines atroces. La terreur de la Magie était finie."

Takakusu, M. The *Samkhya karika*, studied in the light of the Chinese version. Rendered from the French into English by S. S. SURYANARAYANA SASTRI. IV+85 p. (*Bulletin of the Dept. of Indian philosophy*, no. 1). Madras, Diocesan Press, 1933. ISIS

Reviewed by E. J. THOMAS, *Journal of the royal Asiatic society* 531, 1935. This is the translation of the French version published in 1904 (*Introd.* 1, 351). G. S.

Vth Century (second half)

Bidez, J. Un opuscule inédit de PROCLUS. *Académie des inscriptions*, Comptes rendus, 280-83, 1927. ISIS

A propos du *De sacrificio et magia*. " L'idée d'une sympathie magique animant la nature au point d'y faire prier harmonieusement tous les êtres, a eu la vie plus longue que l'on ne serait tenté, peut-être, de le croire. On en retrouve la trace notamment chez certains mystiques chrétiens qui s'inspirèrent de PROCLUS. Si, pour faire comprendre le symbolisme des mystères néoplatoniciens, il fallait trouver des analogies chez les penseurs modernes, c'est dans la philosophie de la nature de NOVALIS qu'il serait bon de les chercher d'abord. Son interprête, MAETERLINCK, aurait pu aisément faire figurer, dans ce qu'il dit de l'intelligence des fleurs, la prière silencieuse du lotus et l'hymne que PROCLUS crut entendre chanter par l'humble tournesol en l'honneur d'HÉLIOS son Roi." (p. 283).

Curtis, Heber D.; Robbins. Frank E. An ephemeris of 467 A.D. *Publications of the Observatory of the University of Michigan* 6, 77-100, 1 pl., 1935 (received Oct. 1935). ISIS

Very remarkable reconstruction of three small papyrus fragments of the University of Michigan, which must have been of immense difficulty. " The writers have given intermittent attention to the puzzles presented by this papyrus during the past two and a half years. As to the division of labor,—all questions as to the reading of the document and calendrical matters fell naturally to ROBBINS because of his experience in reading papyri from the Egyptian area. To CURTIS is due the discussion of the astronomical content of the papyrus, and the calculation of planetary positions and phenomena." (p. 77).

Conclusion: " The very close agreement, when account is taken of

precessional changes, of the positional entries of the heavenly bodies in this ephemeris proves beyond all doubt that the papyrus was written in the year 467 A. D., and quite probably in July or August of that year. For the priest or astronomer who computed this ephemeris, perhaps for some professional astrologer, or for some man of affairs who felt the need of celestial guidance in his mundane interests, would scarcely have calculated it long in advance, simply because there would be little need for it before the new Egyptian year began on August 30. There are few Greek documents that can be dated with greater precision. The present ephemeris, in effect a primitive Nautical Almanac of the year 467 A. D., is perhaps the only example of an ephemeris of this period that has come down to us. It is of great interest historically, not only as exemplifying the directions for the construction of ephemerides given by THEON about 400 A. D., but also as showing the state of the astronomical science of that date." (p. 100).
G. S.

VIth Century (whole and first half)

Walter, Georg. Zum sogennanten ESCOLAPIUS (Aus Cod. Leṅinopolitanus lat. F. v. VI. 3). *Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* 4, H. 3, 122-27, 1935.
ISIS

I classify WALTER's paper in this section to conform with the tentative classification in my *Introduction* (vol. 1, 434) but the date of *Aesculapius* is of course very uncertain (say sixth or seventh century). G. S.

Wellmann, Max (1863-1933). TIMOTHEOS von Gaza. *Hermes* 62, 179-204, 1927. ISIS

Author of a book on animals. G. S.

VIIth Century (whole and first half)

Sengupta, P. Ch. The Khaṇḍakhādyaka, an astronomical treatise of BRAHMAGUPTA. Translated into English with an introduction, notes, illustrations and appendices. xxx+204 p. Calcutta, University Press, 1934. ISIS

Reviewed by SOLOMON GANDZ, *Isis* 23, 262-63, 1935.

Vogel, K. ANANIA of Shirak (Shiragooni) (see S.M., v. 1, p. 181-1[illegible]2). *Scripta mathematica* 3, 283, 1935. ISIS

VIIth century (second half)

Erhardt-Siebold, Erika von. ALDHELM's Chrismal. *Speculum* 10, 276-80, 1 pl., 1935. ISIS

Furlani, Giuseppe. Le Categorie e gli Ermeneutici di ARISTOTELE nella versione siriaca di GIORGIO DELLE NAZIONI, 68 p. (*Reale Accademia nazionale dei Lincei*, 5, 1). Rome, BARDI, 1933. ISIS

Reviewed by ADOLF RÜCKER, *OLZ* 38, 379, 1935.

Obermann, Julian. Political theology in early Islam, ḤASAN AL-BAṢRI's treatise of Qadar. *Journal of the American oriental society* 55, 138-62, 1935. ISIS

IXth Century (whole and first half)

'Alī ibn Rabbān al-Ṭabarī. (*Introd.* 1, 574). Footnote 6, p. XVII of MINGANA's edition of the Book of treasures of JOB OF EDESSA 1935, (*Isis* 25, 141-4). ISIS

"The information found in SARTON (*Introduction*, p. 565) that RABBĀN AT-ṬABARĪ, the father of IBN RABBĀN AT-ṬABARĪ, the author of *Firdausu'l-ḥikmat*, translated the ALMAGEST into Arabic does not seem to me to be correct. SARTON (ibid., p. 574) states also that 'ALĪ IBN RABBĀN AL-ṬABARĪ was the son of a Jewish physician, but as has been convincingly proved by my edition of his "Book of religion and empire" and by the publication of his *Firdausu-l-ḥikmat*, his father was a Christian and not a Jew."

Ritter, Hellmut. Schriften JA'QŪB IBN ISḤĀQ AL-KINDĪ's in Stambuler Bibliotheken. Mit Beiträgen von MARTIN PLESSNER. *Archiv orientalni* 4, 363-73, 1932. ISIS

Strauss, Bettina. Das Giftbuch des Śānāq. Eine literaturgeschichtliche Untersuchung. 64 p., 66 p. in Arabic. (*Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin*, 4). Berlin, SPRINGER, 1934. ISIS

Reviewed by GEORGE SARTON *Isis* 23, 447-48, 1935.

IXth Century (second half)

Bákoš, Jan. Die Zoologie aus dem *Hexaemeron* des Mōšē bar Kēp(h)ā, hrsg. und übersetzt. *Archiv orientalni* 2, 327-61, 460-91, 1930. ISIS

Bevan, A. A. Notes on certain passages of ad-Dīnawarī. *Muséon* 33, 79-82, 1915. ISIS

Ill'jinskij, G. A. Opyt sistematičeskoj Kirillo-Mefod'jevskoj bibliografiji (Versuch einer systematischen Bibliographie der KYRILL und METHODIUS betreffenden Fragen). XLIV+304 p. Hg. von

der Bulgarischen Akademie der Wissenschaften unter Red. und mit Ergänzungen von M. G. POPRUŽENKO and ST. M. ROMANSKI, Sofia, 1934. ISIS

Meyerhof, Max. Thirty-three clinical observations by RHAZES (circa 900 A.D.). *Isis* 23, 321-56 (357-72, in Arabic), 1935. ISIS

This is a fundamental contribution to the history of mediaeval medicine. A collection of 33 genuine clinical accounts, the text given in Arabic (16 p.) and in English translation with notes. The introduction deals with (A) the biographers of RHAZES (B) Remarks on his *Continens* (C) the text. Arabic *errata* may be obtained by application to the editor. G. S.

Ruska, Julius. Übersetzung und Bearbeitungen von AL-RĀZIS Buch Geheimnis der Geheimnisse. (*Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* 4, H. 3). p. 1-26, Berlin, 1935. ISIS

The great alchemical MS. which belonged to the SPECIALE family and is now in the town library of Palermo was written for the most part by the same hand at the beginning of the fourteenth century. It contains many Latin alchemical treatises, e.g., the *Sermo de aluminibus et palibus* in an older and more complete form than the one edited by ROBERT STEELE (*Isis* 12, 10-46, 1929) and the *Liber Ebu bacchar et Raisy* which RUSKA has identified with a translation of AL-RĀZĪ's *Kitāb sirr al-asrār*, a fundamental work of Arabic alchemy.

"Es kann nicht nachdrücklich genug gesagt werden, dass die Alchemie des lateinischen Westens den Griechen so gut wie nichts, den Arabern so gut wie alles verdankt. Jahrzehntelang hat man auf die Bruchstücke der griechischen Alchemisten gestarrt, als ob aus ihnen der Inhalt und das Wesen der lateinischen Alchemie erklärt werden könne — und hat dabei die nächstliegende Aufgabe versäumt, das abendländische Schrifttum erst einmal auf seine direkten und unmittelbaren Quellen zurückzuverfolgen. Nicht die griechischen Alchemisten, sondern *die Übersetzungen arabischer Originalwerke bilden den Grundstock der lateinischen Alchemie*, und immer wieder sind es Übersetzungen und Bearbeitungen arabischer Autoren, die den Gang der abendländischen Entwicklung bestimmen. Von welchen Umständen die Auswahl der übersetzten Autoren abhing, ist vorerst schwer zu sagen. Besondere Sachkenntnis und kritische Prüfung ist den ältesten Übersetzern kaum zuzutrauen. So werden sie von den Urteilen der Muslime abhängig gewesen sein, denen sie ihre arabischen Vorlagen verdankten, mit anderen Worten, der älteste Bestand der lateinischen Alchemie muss ein Spiegelbild der Literatur sein, die sich im islamischen Westen im 11./12. Jahrhundert weiterer Verbreitung und besonderen Ansehens erfreute. Die vorliegende Arbeit behandelt ein Teilgebiet der der Chemiegeschichte gestellten Aufgabe. Sie bringt den Nachweis, dass eine vollständige Übersetzung von AL-RĀZIS Buch 'Geheimnis der Geheimnisse' in Palermo noch vorhanden ist, und dass alle andern Handschriften, in denen man sie bisher zu finden geglaubt hat, Bearbeitungen und Erweiterungen des ursprünglichen Textes sind. Damit wird zum erstenmal in eine Frage

Licht gebracht, die für *die Entwicklung der Alchemie zur Chemie* von grundlegender Bedeutung ist."

Let us hope that our friend RUSKA will soon be able to publish the text completely. In the meanwhile this study will whet the curiosity of all students of mediaeval science. G. S.

Ruska, Julius. Die Alchemie AR-RĀZĪ's. *Der Islam* 22, 281-319, 1935. ISIS

RUSKA's fundamental studies on RĀZĪ have been discussed twice in *Isis* (vol. 25, 144-5, 189). The present instalment is perhaps the most precious of all : it is a general study on RĀZĪ's alchemy. It is divided as follows : i. Die bibliographischen Quellen; ii. Die Verzeichnisse der alchemistischen Werke; iii. Die arabisch erhaltenen Werke; iv. Ein unterschobenes Werk; v. AR-RĀZĪ's Einfluss auf die arabische Alchemie, 1. Die jüngeren Alchemisten im *Fihrist* des IBN AN-NADĪM, 2. Das alchemistische Kapitel in den *Mafātiḥ al-'ulūm*, 3. Die Alchemie des ABU'L-ḤAKĪM AL-KĀTHĪ, 4) Die Alchemie bei AL-BŪNĪ, 5. Die Londoner Kārschūnī-Texte und der Cod. Sprenger 1908 der Preuss. Staatsbibliothek. G. S.

Xth Century (second half)

Fück, J. Eine arabische Literaturgeschichte aus dem 10. Jahrhundert n. Chr. (Der *Fihrist* des IBN AN NADIM). *Zeitschrift der deutschen Morgenländischen Gesellschaft* 84, 111-24, 1930. ISIS

Dr. FÜCK is preparing a new edition of the *Fihrist*. G. S.

Gray, Louis H. Iranian material in the *Fihrist*. *Muséon* 33, 24-39, 1915. ISIS

Van de Vyver, A. Les Œuvres inédites d'ABBON DE FLEURY. *Revue bénédictine*, N° 2, 125-69, 1935. ISIS

" Avec moins de génie que GERBERT, plus de droiture et plus de justesse, ABBON occupa la position de premier plan, réalisa l'œuvre qui convenait à son Ordre. Son savoir scientifique, moins primesautier, cache, sous des dehors plus traditionnels, une originalité du meilleur aloi. Elle consiste à traiter avec méthode des questions d'astronomie, de mathématiques, de comput ou de logique qu'on avait peu ou point abordées à son époque."

XIth Century (whole and first half)

al-Bīrūnī. The book of instruction in the elements of the art of astrology by ABŪ'L-RAYḤĀN MUḤAMMAD IBN AḤMAD AL-BĪRŪNĪ. Written in Ghaznah, 1029 A.D. Reproduced from Brit. Mus. MS. Or. 8349. The translation facing the text by R. RAMSAY WRIGHT. XVIII+674 p. London, LUZAC, 1934. ISIS

Reviewed by GEORGE SARTON, *Isis* 23, 448-50, 1935.

Buckler, F. W. FIRDAUSI's Shāhnāmah and the Genealogia Regni Dei. *Supplement to the Journal of the American oriental society* no. 1, 1-21, 1935. ISIS

Massé, Henri. Le millénaire du poète persan FIRDOUSI. *Revue des études islamiques* 393-420, 1 pl., 1934. (Received Aug. 1935). ISIS

Ruska, Julius. Zum Avicennatext des Cod. Vadianus 300. *Arch. f. Gesch. d. Med. u. d. Naturw.* 27, 499-510, 1935. ISIS

" Untersuchungen über die Echtheit einiger dem Arzt und Philosophen AVICENNA zugeschriebenen alchemistischen Werke haben ergeben, dass das 1572 zu Basel gedruckte *Liber Abvali Abincine de Anima in arte Alchimiae* eine spanisch-arabische Fälschung ist, die etwa am Anfang des 12. Jahrhunderts verfasst und in der ersten Hälfte des 13. Jahrhunderts ins Lateinische übersetzt wurde. Die entscheidenden Feststellungen mussten am gedruckten Text gemacht werden; in bezug auf gewisse Einzelfragen aber, insbesondere die Aufklärung schwieriger oder offenbar falsch überlieferter Textstellen, die Deutung nicht übersetzter arabischer Worte und die Feststellung der Personennamen konnte ohne Zuziehung der alten Handschriften nicht das letzte Wort gesprochen werden. In einem bestimmten Falle brachte die Vergleichung des gedruckten Textes mit einer Seite der alten Handschrift der Hunterian Library (D. W. SINGER, *Catalogue*, S. 112) wertvolle Verbesserungen. So war der Wunsch verständlich, den berühmten Cod. 300 der Vadiana, der neben anderen wichtigen Texten auch den des *Liber de Anima* enthält, sowohl für die Nachprüfung, der allgemeinen Ergebnisse wie für das Studium der erwähnten Sonderfragen wenigstens nachträglich einsehen zu können." " Fassen wir das Gesamtergebnis in einem Satze zusammen, so lässt sich sagen, dass der Vadianus, so weit der lateinische Text in Frage kommt, vorzüglich überliefert ist, für die arabischen Eigennamen und unübersetzt gebliebenen Worte aber keine nennenswerte neue Hilfe bietet. Hier könnte nur die Entdeckung des arabischen Originals Abhilfe schaffen, und bis dahin wird man sich auch mit einer Neuausgabe des lateinischen Textes gedulden müssen.

Soubiran, André. AVICENNE, prince des médecins. Sa vie et sa doctrine. 176 p. Paris, LIPSCHUTZ, 1935 (20 frs.). ISIS

Biographie et analyse (avec extraits, du premier livre de *Canon*. Bibliographie. L'auteur n'est pas un orientaliste, mais VENTURA l'a aidé pour l'arabe et SIMON pour l'hébreu. Travail de vulgarisation. G. S.

Stegemann, V. Beiträge zur Geschichte der Astrologie I. Der griechische Astrologe DOROTHEOS von Sidon und der arabische Astrologe ABU'L-ḤASAN 'ALI IBN ABI'R-RIǦĀL, genannt ALBOHAZEN. 41 p. (*Quellen und Studien zur Geschichte und Kultur des Altertums und des Mittelalters*). Heidelberg, BILABEL, 1935. ISIS

Contribution to our knowledge of the tradition of Hellenistic astrology to the Islamic world. Very little is known of the astrologer DOROTHEOS of Sidon, not even his time (end of Ist century or beginning of IInd century?), and only fragments of his have come down to us in Greek. However, the Arabic astrologers were apparently well acquainted with him. The present study is restricted to the study of the Dorothean fragments in the works of 'ALI IBN ABI-L-RIJĀL. The few relevant Arabic fragments are quoted and compared with Greek fragments. It would have been better if the author had completed his study of the Dorothean tradition in Arabic before publication. G. S.

XIth Century (second half)

Gérard, Robert. Sur un prieuré bénédictin de la route des pèlerinages. SAINT-G'LLES DE MONTOIRE (XI[e] siècle). 70 p., 13 pl., 16 fig. Paris, Editions d'art et d'histoire, 1935 (18 francs). ISIS

Trois siècles avant la fondation de Cluny (910) l'ordre de saint Benoît jalonnait déjà les pèlerinages et les dirigeait. Sans doute cette organisation fut-elle considérablement améliorée et fortifiée par les Clunisiens (voir mon *Introd.*, vol. 1, 774). L'établissement et la défense des routes conduisant à Saint-Jacques de Compostelle fut un des aspects que prit la croisade séculaire contre les Maures d'Espagne. L'étude de l'iconographie byzantine et singulière de Saint-Gilles (en Touraine) prouve qu'elle fut inspirée en partie par Cluny et en partie par l'école du Mont Cassin, dont un des abbés, DÉSIDÉRIUS (plus tard pape VICTOR III), visita Byzance en 1065 pour en ramener des artistes et spécialement des mosaïstes. Étude très intéressante, admirablement illustrée. G. S.

Kumarappa, Bharatan. The Hindu conception of the deity as culminating in Rāmānuja. XV+356 p. London, LUZAC, 1934. ISIS

Reviewed by HORACE I. POLEMAN, *Journal of the American Oriental Society* 55, 329-30, 1935.

Williamson, H. R. WANG AN-SHIH, a Chinese statesman and educationalist of the Sung dynasty (vol. 1). X+388 p. London, PROBSTHAIN, 1935. ISIS

I indicated the importance of WANG AN-SHIH in vol. 1 of my *Introd.*, p. 781. However, "apart from two articles by J. G. FERGUSON in the *Journal* of the North China Branch of the Royal Asiatic Society, and an essay by C. W. ALLAN in his *Makers of Cathay*, very little has been written on WANG AN-SHIH in the English language. In German OTTO FRANKE has issued an admirable treatise: *Der Bericht Wang Ngan-Schis von* 1058 *über Reform des Beamtentums. Ein Beitrag zur Beurteilung des Reformators.* Berlin, 1932. The present work, therefore, is based almost entirely on Chinese sources. In this connection it is to be regretted that owing to the iconoclastic policy of his political opponents, much of WANG AN-SHIH's literary work has been wantonly destroyed. He produced a dictionary and

wrote extensively on the interpretation of the Classical literature of China. But unfortunately all that remains of this section of his labours is the New Interpretation of the Government System of Chow, styled the *Chow Kuan Hsin I*. In addition to this, there was published in 1918 by the Sao Yeh Shan Co. what purports to be a complete edition of the rest of the works which are extant. This consists of eight volumes of poetry and sixteen of prose, comprising his letters, inscriptions, essays, government memorials, etc., and claims to be substantially the same as the editions published during the Sung dynasty. A separate edition of his poetry, consisting of fifty volumes with a commentary by LI YEN HU and claiming to be a reprint of the Mongolian edition as issued by the Ch'ing I Chai has been recently published by the Commercial Press. These, together with the Chinese Histories and the works of TS'AI SHANG HSIANG and LIANG CH'I CH'AO referred to above, form the main sources of the present work." Two more volumes are being prepared. G. S.

XIIth Century (whole and first half)

Chabanier, Eugène. Un cosmographe du XII^e^ siècle capable de mesures exactes de longitudes. *Académie des inscriptions et belles-lettres*, Comptes rendus, 344-52, Paris 1932. ISIS

Apropos of the Tables of RAYMOND of Marseilles (*Introd.*, 2, 210). The author concludes : " Il est donc bien évident qu'au moyen âge on savait corriger les longitudes ptoléméennes, qu'on pouvait atteindre une précision que chercheront longtemps les astronomes de la Renaissance. J'ai par un texte du roi ALPHONSE montré que ce problème était connu, je ne crois pas que la méthode des éclipses pouvait donner des résultats aux grandes distances. Peut-être ferai-je admettre plus tard que les *verificatores* observaient l'heure de passage par le point vernal, par rapport au midi moyen de la saison des équinoxes. Il suffit de pouvoir dire que, à côté des ' maitres pour faire carte ' à côté des ancêtres d'ABRAHAM CRESQUES, il y avait des astronomes, qui dans leur cellule, auraient pu faire des cartes ' exactes ' pour l'époque, et que RAYMOND de Marseille ne fut pas loin d'y penser."

Darby, H.C. A note on an early treatise on the astrolabe. *Geographical journal* 85, 179-81, 1935. ISIS

" So far as I know, the *De operatione astrolabii* of ADELARD OF BATH is the earliest treatise on the astrolabe written by an Englishman." Of this there are two manuscripts. C. W. A.

Faraj, Dr. Les médecins musulmans d'Andalousie et le serment d'HIPPOCRATE. *Cahiers du Sud* 22, 95-97, 1935. ISIS

See on the same subject *Isis* 20, 262; 22, 222-3. This concerns IBN ZUHR. G. S.

Lévy, Louis-Germain. La philosophie d'ABRAHAM IBN EZRA. *Revue des études juives* 89, 169-78, 1930. ISIS

XIIth Century (second half)

Basmadjian, K. J. Notes sur l'histoire de la médecine arménienne. *Revue des études arméniennes* 7, 179-80, 1927. ISIS

Apropos de MEKHITHAR of Her (*Introduction* 2, 441). G. S.

Castiglioni, Arturo. MOSE MAIMONIDE medico e filosofo nell'ottavo centennario della sua nascita (1135-1935). 23 p. *Rass. clin. scient.* 13, 1935. ISIS

Fischer, I. Der Arzt MAIMONIDES, einer der grössten Philosophen aller Zeiten. *Wien. med. Wschr.* 13 p., 1935. ISIS

Friedenwald, Harry. MOSES MAIMONIDES the physician. *Bulletin of the Institute of the history of medicine* 3, 555-84, 2 pl., 1935. ISIS

Gasperini, Carlo G. Il letterato BURGUNDIO e la sua attività nel campo della medicina. *Rivista di storia delle scienze mediche e naturali* 26, 84-91, 1935. ISIS

Gershenfeld, Louis. MOSES MAIMONIDES. (Cordova 1135-Cairo 1204). *Medical life* 42, 1-34, 1 fig., 1935. ISIS

Gottheil, Richard. Fragments of a short medical vocabulary from the Cairo Genizah. *Jewish quarterly review* 26, 7-27, 1935. ISIS

Hebrew text with English translation. G. S.

Husik, Isaac. MAIMONIDES and SPINOZA on the interpretation of the Bible. *Supplement to the Journal of the American Oriental Society* no. 1, 22-40, 1935. ISIS

Kratchkovsky, Ignacio. Un manuscrito de las " Laṭā'if al-dhakhīra " de IBN MAMMĀTĪ en Leningrado. *Al-Andalus* 3, 89-96, 1935. ISIS

Leveen, J. The MAIMONIDES commemoration. *British Museum Quarterly* 10, 39-43, 1935. ISIS

Lévy, Louis-Germain. MAIMONIDE. Nouvelle édition. II+287 p. (*Les grands philosophes.*) Paris, ALCAN, 1932. ISIS

Première éd., 1911 : " Dans la présente étude, nous nous sommes appliqué à une exposition systématique détaillée de la psychologie, de la morale et de la métaphysique de l'illustre docteur. Cette exposition est précédée d'un coup d'œil sur l'histoire de la philosophie juive jusqu'à MAIMONIDE, et on en

souligne les rapports avec les spéculations grecque, alexandrine et arabe. Après l'analyse de l'œuvre maïmonidienne, nous en marquons l'influence sur le judaïsme, l'islamisme et le christianisme. Nous signalons les polémiques que certaines affirmations du grand théologien soulevèrent parmi les rabbins, la critique pénétrante à laquelle HASDAI CRESCAS soumit les idées de son devancier, l'impression qu'un THOMAS D'AQUIN, un SPINOZA, un LEIBNIZ reçurent de la lecture de *Guide des Indécis*."

1. Vie et œuvres de MAIMONIDE; 2. Sources; 3. Préparation à la philosophie; 4. L'être et le devenir; 5. Le monde supérieur et le monde inférieur; 6. L'âme; 7. La connaissance; 8. Existence et nature de Dieu; 9. Omniscience et providence divines; 10. Morale théorique; 11. Morale appliquée; 12. Sanction; Conclusion — Influence de MAIMONIDE ; Bibliographie.

Macht, David I. MOSES MAIMONIDES, physician and scientist, the WILLIAM OSLER of medieval Arabic and Hebrew medicine. *Bulletin of the institute of the history of medicine* 3, 585-98, 1935. ISIS

(Maimonides). Traité des poisons, avec une table alphabétique de noms pharmaceutiques arabes et hébreux d'après le Traité des synonymies de CLÉMENT-MULLET. Traduction française par I. M. RABBINOWICZ (1818-1893). 2e édition. 70 p. Paris, LIPSCHUTZ, 1935 (20 frs.). ISIS

Photographic reprint of the edition of 1865 for which see my Introduction, 2, 378. G. S.

Marx, Alexander. MOSES MAIMONIDES (Maimonides octocentennial series). 27 p., facs. New York, Maimonides octocentennial committee, 1935. ISIS

Meyerhof, Max. Sur un glossaire de matière médicale arabe composé par MAIMONIDE. *Bulletin de l'Institut d'Egypte* 17, 223-35, 1934-35. ISIS

" Nous venons de commémorer le huitième centenaire de MAIMONIDE. A cette occasion, j'ai eu l'honneur de dire quelques mots sur un ouvrage arabe récemment découvert et presque inconnu de cet auteur, ouvrage dont je rendrai succinctement compte dans le troisième volume des *Mélanges Maspero*. Permettez-moi de vous donner ici un aperçu plus détaillé de ce livre intéressant qui révèle un côté jusqu'ici ignoré de l'activité scientifique de MAIMONIDE. Avant d'aborder mon sujet j'ai besoin de vous initier brièvement à l'histoire des glossaires pharmacologiques chez les Arabes."

Münz, Isak. MAIMONIDES (The Rambam). The story of his life and genius. Transl. from the German, with an introduction, by HENRY T. SCHNITTKIND. Octocentennial edition. XXX+238 p. (*Jewish Bookshelf*, 1). Boston, WINCHELL-THOMAS, 1935 ($1.50). ISIS

MOSES BEN MAIMON (1135-1204) of Cordova, Fez, Palestine, and Cairo,

was one of the outstanding Hebrew leaders and scholars of the 12th century, the octocentenary of whose birth is the occasion of Dr. MÜNZ's biography freely translated by Dr. SCHNITTKIND. This is the initial volume of a series of Jewish masterpieces. The introduction is an appraisal of his philosophy, ethics, and their liberalizing effect on Jewish religion and culture. The first five chapters deal with his early life and his cultural background, his *Jewish Calendar*, *Treatise on logic*, *Commentary on the Mishnah*, *Gate of hope*, *Mishneh-Torah*, and the summary of his philosophy in his *Guide to the perplexed*. The sixth chapter discusses his work as a physician. He drew from Arabic scientific and medical sources, and medicine became an integral part of his religion. His biographer enlarges upon his services in freeing the medical profession from rabbinical extinction and advancing the recognition of its objective and scientific basis. He was a follower of HIPPOCRATES and GALEN and of the STAGIRITE. The Jewish predilection for the healing art is a social inheritance from this great leader. His spirit of tolerance in times of intolerance under tyrants and Jew-baiters of old still shines. C. A. K.

Rosenblatt, Samuel. The position of MAIMONIDES in the history of philosophy. *Bulletin of the institute of the history of medicine* 3, 545-54, 1935. ISIS

Ventura, M. MAIMONIDE, Makala fi sana'at al-mantik. Terminologie logique. 144 p. Paris, LIPSCHUTZ, 1935. ISIS

Édition critique du texte hébreu traduit et commenté en français, avec introduction et lexique hébreu, arabe, grec, latin, allemand, anglais et français. Édition de l'original arabe des chapitres existants.

Yahuda, A. S. MOSES MAIMONIDES, the philosopher and physician, his time and influence. Extract from *Jewish Daily Post*, July 19, 1935, *Journal royal asiatic society*, 792-5, 1935. ISIS

XIIIth Century (whole and first half)

Ibn al-Athīr (*Introd.*, 2, 682). Says E. DE ZAMBAUR in the preface to his monumental *Manuel de généalogie et de chronologie pour l'histoire de l'Islam* (2 vols., Hanovre 1927) : " J'ai commencé, il y a de longues années, à traduire et à commenter IBN-AL-ATHĪR, en partant, bien entendu, du point où cesse le récit de ṬABARĪ, à savoir de l'an 302 de l'hég. Cette œuvre immense est aujourd'hui presque achevée ; les index analytiques, les glossaires, les tableaux synoptiques et généalogiques ont pris des dimensions effrayantes ; aucun libraire n'en oserait l'édition. Ce travail forme la base de la plupart des chapitres de mon livre. Au fur et à mesure du progrès de mes lectures dans les autres historiens arabes et européens, j'ai ajouté les chapitres traitant les périodes postérieures à la mort d'IBN AL-ATHĪR. Ainsi

est née l'idée du livre présent qui, j'ose bien l'espérer, a fait un progrès sensible dans la voie tracé par M. St. L.-POOLE." G. S.

ISIS

Kapp, A. G. Arabische Übersetzer und Kommentatoren EUKLIDS, sowie deren math.-naturwiss. Werke auf Grund des *Ta'rīkh al-Ḥukamā'* des IBN AL-QIFṬĪ. *Isis* 23, 54-99, 1935. (To be cont'd).

ISIS

Pirenne, Henri. (1862-1935) Les " overdraghes " et les " portes d'eau " en Flandre au XIII[e] siècle, à propos d'une charte inédite provenant des archives de la ville d'Ypres. *Essays in mediaeval history presented to* T. F. TOUT, p. 139-45, Manchester, 1925. ISIS

Russell, Josiah C. Medical writers of thirteenth century England. *Annals of medical history* 7, 327-40, 1935. ISIS

Thomson, S. Harrison. The " notule " of GROSSETESTE on the Nicomachean ethics. *Proceedings of the British Academy* 19, 195-218, 1933. ISIS

Vosté, J.-M. (O. P.) Deux manuscrits des Dialogues de JACQUES BAR SHAKKO. *Muséon* 42, 157-67, 1929. ISIS

Apropos of the Jacobite theologian JACOB BAR SHAKKŌ of Barṭallā near Mūṣul (*Introd.* 2, 603). G. S.

Weinberg, Josef. The disputation between LEONARDO of Pisa and JOHN of Palermo. *Scripta mathematica* 3, 279-81, 1935. ISIS

XIIIth Century (second half)

Aiken, Pauline. VINCENT of Beauvais and Dame PERTELOTE's knowledge of medicine. *Speculum* 10, 281-87, 1935. ISIS

(Bacon, Roger). Opera hactenus inedita ROGERI BACONI. Fasc. 12 : Questiones supra librum de causis. Nunc primum edidit ROBERT STEELE, collaborante FERDINAND M. DELORME. Accedit Liber de causis a ROBERTO STEELE. XXIV+196 p. Oxford, Clarendon Press, 1935. ISIS

Janssens, Herman F. Crème de la science ou Science des Sciences ? Le vrai titre d'un ouvrage de BAR HEBRAEUS. *Muséon* 43, 365-72, 1930. ISIS

Le premier de ces titres est le vrai. G. S.

Johnstone, Hilda. Archbishop PECHAM and Council of Lambeth of 1281. *Essays in mediaeval history presented to* T. F. TOUT, p. 171-88, Manchester, 1925. ISIS

Lentz, Wolfgang. War MARCO POLO auf dem Pamir? *Zeitschrift der deutschen Morgenländischen Gesellschaft* 86, 1-32, 1932. ISIS

Majumdar, Girija Prasanna. *Upavana-vinoda.* A Sanskrit treatise on arbori-horticulture. 128 p. (Indian research institute publication, Indian positive sciences series—no. 1). Calcutta, Indian Research Institute, 1935 (Rs. 2/8, Sh. 4/3). ISIS

"The *Śārṇgadhara-paddhati* is an anthology compiled by ŚĀRṆGADHARA. It is an encyclopaedic work dealing with a variety of subjects, such as asceticism, erotics, rhetoric, medicine, politics, economics, botany, chemistry, cosmetics, criticism in general, philosophy, science of war, and so forth. It practically surveys the whole of human life in its most superficial as well as its deepest aspects. Of this an interesting chapter, *Upavana-Vinoda*, treating of arbori-horticulture, is translated in these pages. The author of this treatise was, as is clear from the introductory verses, ŚĀRṆGADHARA, a courtier of king HAMMIRA of Śākambhari-deśa (modern Bundelkhand) who flourished in the 13th century A.D. (1283-1301). HAMMIRA was a powerful monarch, a great patron of learning and himself a writer. He was defeated and killed by ALAUDDIN KHILIJI, and had he not been a contemporary of the latter he would perhaps have figured in history as a conspicuously great monarch. It appears from the opening verses that the author undertook to compile the treatise at the command of his king for the benefit of his subjects. The chapter *Upavana-Vinoda* deals with the following topics: (1) Glory of trees, (2) Good and evil omens relating to residence near trees, (3) Selection of soil (for planting trees), (4) Classification of plants, (5) Sowing of seeds, (6) The process of planting, (7) Watering of plants (after planting), (8) The rules for the protection of plants, (9) Construction of a garden house, (10) Examination of the soil where wells are to be dug, (11) Rules for the nourishment of plants, (12) Kūṇapa water (recipe for a nutrient solution), (13) Treatment of plants in disease and health, (14) Botanical marvels and (15) Ascertainment of the price of things."

This is an important contribution to our knowledge of Hindu science. In his analysis (33 p.) the author refers to many earlier Sanskrit publications, and hence his introduction is a history of the subject (in India). This is followed by the Sanskrit text, the English translation, a bibliography, and a list of plants. It is a pity that the Latin names of plants have not been included in the alphabetical order. See another book by the same writer on Hindu botany in the section India. G. S.

Meyerhof, Max. IBN AN-NAFĪS (XIIIth cent.) and his theory of the lesser circulation. *Isis* 23, 100-20, 1935. ISIS

A. Introduction; B. A short sketch of medical life in Damascus and Cairo during the XIIIth century A.D.; C. The biography of IBN AN-NAFĪS according

to AṢ-ṢAFADĪ and AL-'UMARĪ; D. A short review of IBN AN-NAFĪS' works; E. IBN AN-NAFĪS' commentary on IBN SĪNĀ's anatomy; Conclusion. "It was and still remains the undying honour of WILLIAM HARVEY to have proved the entire system of circulation; the conclusive experimental proof was given by him, not in his famous book in 1628, but only in 1651, when he wrote to a German practitioner in Hamburg telling him that he had succeeded in propelling water from the pulmonary artery to the pulmonary veins in bodies. It is now certain that the first of his precursors was IBN AN-NAFĪS, who based his discovery on pure scientific speculation, forbidden as he was the opportunity of making dissections even on animals."

Moses of Palermo and Faraj ben Salīm (*Introd.*, 2, 833). The paper by WILLY COHN : Jüdische Übersetzer am Hofe KARLS I von Anjou (*Monatschrift für Geschichte und Wissenschaft des Judentums* 79, 246-60, 1935), contains new material on the personal relations of the king to the translators and the salaries paid to them and to the copyists of the Hāwī. S. GANDZ.

Pareja Casañas, Félix M. Libro del ajedrez, de sus problemas y sutilezas de autor árabe desconocido. Según el MS. arab. add. 7515 (Rich) del Museo Británico. Texto árabe, traducción y estudio previo. 2 vols. 257+250 p.; CXXIX-248 p. (*Publicaciones de las escuelas de estudios árabes de Madrid y Granada*. Serie A, num. 3). Madrid, 1935 (en España, 50 pesetas, en el extranjero, 56 pesetas). ISIS

Arabists who are also chess players (a not unusual combination) will be very grateful to the Jesuit Father FELIX PAREJA for having taken the immense trouble of editing this unique B. M. MS., Kitāb fīl-shaṭranj wa manṣūbātihi wa-mulaḥihi (Book of chess, its problems and subtleties) completed in 1257 by an unknown Eastern Arabic writer. It is the MS. quoted on p. 173 of H. J. R. MURRAY's monumental *History of chess* (Clarendon Press, 1913). Alas! I am not a chess player, and hence I cannot appreciate the subtleties of this work nor even enjoy its reading.

The work seems to have been done with considerable care : Vol. 1 contains the Arabic text together with a Spanish translation, vol. 2, a long Spanish introduction discussing the Ms., the history of chess in Islām and other cognate topics, then a valuable glossary of Arabic technical terms (27 p.) and a technical analysis of the work.

A magnificent addition to the technical Arabic literature and to the world literature of chess. G. S.

Vosté, J.-M. (O. P.) Memra en l'honneur de IAHBALLAHA III. *Muséon* 42, 168-76, 1929. ISIS

See my note on Rabban BAR ṢAUMA. (*Intr.* 2, 1068-70). G. S.

Winter, Heinrich. PETRUS PEREGRINUS von Maricourt und die magne-

tische Missweisung. *Forschungen und Fortschrifte* 11, 304-06, 1935. ISIS

" Im Sinne dieser Blickrichtung ist das sich aus der 'Epistola' ergebende Gesamtbild das folgende : Die geringe Deckung zwischen seiner Lehre und den experimentellen Möglichkeiten oder Zweckmässigkeiten gestattet nicht, P. systematisches Experimentieren besonders nachzurühmen. Er beherrseht das Wissen seiner Zeit nicht voll, selbst da nicht, wo es in der Praxis verbreitet war. Das muss zu der Annahme führen, dass er nur vorhandene Lehren zusammengefasst hat, aber in einer Form, die, ohne mängelfrei zu sein, äusserlich blendet und damit seinen Ruf begründet hat. Er ist gewissermassen ein glänzender Literat, der einen wissenschaftlichen Stoff behandelt. Inwieweit das auch auf die zweite von ihm erhaltene Arbeit über das Astrolabium zutrifft, soll geprüft werden."

Winter, Heinrich. Seit wann ist die Missweisung bekannt ? *Annalen der Hydrographie und Maritimen Meteorologie* 352-64, 1935. ISIS

Die Missweisung " wurde schon einmal mit 1269 angegeben und zwar von THEVENET im Jahre 1681, der in der Leydener Handschrift der *Epistola de magnete* PETRUS PEREGRINUS von Maricourt (1269) einen Zusatz von späterer Hand für original angesehen hatte. Dieser Irrtum ist schon 1868 von BERTELLI berichtigt worden. Nun findet sich aber die Missweisung doch bei PEREGRINUS, freilich an einer anderen Stelle und nicht ausdrücklich, sondern verkappt, ohne dass PEREGRINUS selbst sie erkannt hätte." The discussion of PEREGRINUS' knowledge of declination is followed with two appendices : A. Die Teilung und Zählrichtung der ersten Kompasse; B. Quecksilber in der alten Seefahrt ? G. S.

XIVth Century (whole and first half)

Barbi, Michele. La vita nuova di DANTE ALIGHERI. Critical edition. Florence, BEMPORAD, 1932. ISIS

Baudry, L. Fragments inconnus de G. D'OCCAM : le Tractatus de principiis theologiae. *Académie des inscriptions*, Comptes rendus, 46-55, 1927. ISIS

" Ces brèves remarques paraissent offrir un double intérêt. En premier lieu elles permettront de compléter et de rectifier la liste des manuscrits des œuvres de G. D'OCCAM dressée par LITTLE dans son ouvrage : *The Grey Friars in Oxford* et de préciser l'inventaire des manuscrits latins de la Bibliothèque nationale. Elles montrent ensuite que les œuvres de G. D'OCCAM doivent être utilisées avec une extrême prudence. Aussi longtemps qu'une édition critique de ses écrits n'aura pas été publiée, toute étude sur la pensée philosophique du célèbre franciscain demeurera sujette à caution."

Dante Alighieri. Il Convivio ridotto a miglior lezione e commentato

da G. BUSNELLI e G. VANDELLI con introduzione di MICHELE BARBI. Vol. 1. LXVIII+486 p. Florence, LE MONNIER, 1934. ISIS

Reviewed by FRIEDRICH SCHNEIDER, *DLZ* 6, 973-78, 1935.

Langlois, Charles V. HUGO de Novocastro or De Castronovo, Frater Minor. *Essays in mediaeval history presented to* T. F. TOUT, p. 269-75, Manchester, 1925. ISIS

Schlumberger, Gustave. Le sceau de la compagnie des Routiers catalans, à Gallipoli, 1305. *Académie des inscriptions*, Comptes rendus, 131-37, 1925. ISIS

Schneider, Friedrich. DANTE. Eine Einführung in sein Leben und sein Werk. 188 p. Weimar, BÖHLAU, 1935. ISIS

Reviewed by ULRICH LEO, *DLZ* 6, 1730-36, 1935.

Tricot-Royer, Dr. YPERMAN à Namur. 9 p. Anvers, Editions YPERMAN (s. a.). ISIS

Vinogradoff, Paul. RALPH of Hengham as chief justice of the common pleas. *Essays in mediaeval history presented to* T. F. TOUT, p. 189-96, Manchester, 1925. ISIS

XIVth Century (second half)

Borchert, Ernst. Die Lehre von der Bewegung bei NICOLAUS ORESME. XVI+112 p. (*Beiträge z. Gesch. d. Philos. u. Theol. d. Mittelalters. Texte u. Untersuchgn.* 31). Münster i. W., ASCHENDORFF, 1934. ISIS

Reviewed by ADOLF DYROFF, *DLZ* 6, 1721-23, 1935.

Collijn, Isak. Birgittinska gestalter. Forskningar i italienska arkiv och bibliothek. XII+134 p., 5 pl. Stockholm, MICHAELISGILLET, 1929. ISIS

Reviewed by G. S., *Isis* 23, 450-52, 1935.

Collijn, Isak. Acta et processus canonizationis Sanctae BIRGITTAE. Codex holmiensis A 14. Med inledning av ISAK COLLIJN (avec une traduction française). Handskrifter från sveriges medeltid utgivna i ljustryck 1. Stockholm, Fritzes Kungl. hovbokhandel, 1920. ISIS

Reviewed by G. S., *Isis* 23, 450-52, 1935.

Collijn, Isak. Acta et processus canonizacionis beate BIRGITTE. Sammlingar utgivna av svenska Fornskriftsällskapet. Andra serien. Latinska skrifter, Band 1. LV+692 p. Uppsala, ALMQVIST & WIKSELLS, 1924-31. ISIS

Reviewed by G. S., *Isis* 23, 450-52, 1935.

Collijn, Isak. Iconographia birgittina typographica. BIRGITTA och KATHERINA i medeltida bildtryck. 2 parts. Stockholm, ALMQVIST & WIKSELL, 1915-18. ISIS

Reviewed by G. S., *Isis* 23, 450-52, 1935.

Cumming, William Patterson. The revelations of Saint BIRGITTA. Edited from the fifteenth century MS. in the Garrett collection in the Library of Princeton University. XL+135 p. (*Early English text society*, no. 178). London 1929. ISIS

Reviewed by G. S., *Isis* 23, 450-52, 1935.

Karpinski, Louis C.; Staubach, Charles N. An Anglo-Norman algorism of the fourteenth century. *Isis* 23, 121-52, 1935. ISIS

"This algorism occupies the first two leaves and the recto of the third, double columns, of the manuscript containing the important *Scala Chronica* by THOMAS GRAY of Oxford, begun in the year 1355. We are indebted to the authorities of Corpus Christi College for permission to secure rotographs of the manuscript. I am further indebted to the Master of the College for the opportunity in September of 1933 to examine the manuscript itself and thus to correct several readings obscure due to folds in the vellum. There seems to be little doubt that the algorism was prepared about the same time as the *Scala Chronica* since the two leaves of the algorism constitute an integral part of the first quire of vellum leaves while the handwriting and the vocabulary are entirely similar to that employed in the Chronicle." Edition of the old French text with English translation and abundant philological and scientific notes. G. S.

Lowes, John Livingston. The art of GEOFFREY CHAUCER. (Sir ISRAEL GOLLANCZ memorial lecture.) *Proceedings of the British Academy* 16, 297-326, 1930. ISIS

Mahmassani, Sobhi. Les idées économiques d'IBN KHALDOUN. Essai historique, analytique et critique. 229 p. Lyon, BOSC Frères et RIOU, 1932. ISIS

"Ce grand historien et philosophe musulman du XIV^{e} siècle est aussi un économiste. Plusieurs orientalistes européens et auteurs arabes se sont préoccupés seulement de traduire ou d'analyser ses théories philosophiques, sociales ou historiques. Ils ont tout à fait délaissé ses idées économiques.

Cette négligence peut s'expliquer, d'une part, par le fait que la science économique est plus récente que l'histoire ou la philosophie, et, d'autre part, par la minime proportion de l'œuvre économique d'IBN KHALDOUN par rapport à ses œuvres historiques et philosophiques. L'auteur lui-même ne savait pas qu'il était économiste ni qu'il existait une science économique... Les Prolégomènes de notre auteur seront la source principale de cet Essai. Toutes les citations et les renvois qui s'y trouvent se rapporteront à une édition de l'imprimerie Bahia du Caire (1322 de l'hégire), édition plus récente que celle de Boulak. Les deux éditions, il est à noter, ne diffèrent pourtant que par la pagination."

Nunn, George E. The *Imago mundi* and COLUMBUS. *American historical review* 40, 646-61, 1935. ISIS

"The *Imago mundi* was of little importance in the formulation of COLUMBUS's plans for his first voyage. That voyage, contrary to the view of VIGNAUD, was based on a geographical concept that combined MARCO POLO's account of eastern Asia with PTOLEMY's geography in the manner of the BEHAIM globe. COLUMBUS rejected the longitudes of the BEHAIM concept because he accepted 56 $^{2}/_{3}$ Italian nautical miles as the true measure of an equatorial degree instead of the 62 $^{1}/_{2}$ commonly accepted by his European contemporaries. This placed eastern Asia and Cipango at about 1100 leagues and 750 leagues respectively west of the Canary Islands. On his third voyage however the curiosity of COLUMBUS was provoked by the *Imago mundi* statement that India approached very near to Ulterior Spain or Africa. Following its discovery, South America was regarded for a time as MARCO POLO's greatest island of the world, rather than as a part of the mainland of Asia. After the failure of the fourth voyage of COLUMBUS South America came to be commonly accepted as a part of Asia. It was so regarded by LAS CASAS and MAGELLAN. Meanwhile, in the years between the discovery of America and COLUMBUS's death, when he was constantly faced with the opposition of the followers of PTOLEMY, COLUMBUS found strong support for his claim that his discoveries constituted a part of Asia in the *Imago mundi* of PIERRE D'AILLY."

Pruckner, Hubert. Studien zu den astrologischen Schriften des HEINRICH VON LANGENSTEIN. XIV+286 p. (Studien der Bibliothek Warburg). Leipzig, TEUBNER, 1933. ISIS

Reviewed by G. S., *Isis* 23, 452-54, 1935.

Ryckmans, G.; Moreau, Fernand. Un gnomon arabe du XIV^{e} siècle. *Muséon* 39, 33-40, 1926. ISIS

Made by ABŪ-L-QĀSIM IBN ḤASAN AL-SHADDĀD in Tunis 756 (1355).
G. S.

Vorwahl, H. Die Medizin bei BOCCACCIO. *Archiv für Geschichte der Medizin und der Naturwissenschaften* 28, 125-27, 1935. ISIS

Whiting, B. J. Proverbs in the writings of JEAN FROISSART. *Speculum* 10, 291-321, 1935. ISIS

XVth Century (whole and first half)

Alberti, Leon Battista (1404-72). De re aedificatoria libri decem. XXVI+392 p., figs. Moscow, Architectural Library, 1935. ISIS

Russian translation of that great architectural classic, the original Latin text of which was first published in Florence 1485, then in Paris 1512. This is the first volume, beautifully gotten up; the second and last volume is scheduled to appear in 1936. G. S.

Arrowood, Charles F. Sir JOHN FORTESCUE on the education of rulers. *Speculum* 10, 404-10, 1935. ISIS

Browne, Edward G. The Mujmal or "Compendium" of history and biography of Faṣīḥī of Khwāf. *Muséon* 33, 48-78, 1915. ISIS

Dumont, Louis. Les Portugais illustres. I. Dom HENRI, le Navigateur, né le 4 mars 1394. Mort le 13 novembre 1460. Etude de psychomorphologie historique. *Arquivo de anatomia e antropologia* 16, 51-73, illus., Lisbon, 1934. ISIS

"En résumé, la morphologie vraisemblable de Dom HENRI est celle d'un cubique ondulé, musculaire, cérébral, respiratoire, digestif et sa psychologie, celle d'un grand croyant, d'un grand missionnaire, d'un grand animateur, d'un grand chef."

Ginsburger, M. Les Juifs et l'art militaire au moyen âge. *Revue des études juives* 88, 156-66, 1929. ISIS

Apropos of a Hebrew translation of the *Feuerwerksbuch* of ABRAHAM OF MEMMINGEN (1410). "Les Juifs du moyen âge, contrairement à ce qu'on admet généralement, n'étaient pas exclusivement des commerçants, mais s'adonnaient aussi aux arts et métiers. Il est vrai que, sur ce chemin, ils rencontraient souvent de grands obstacles et devaient abandonner leur religion, s'ils voulaient arriver à une position stable et respectée." G. S.

Nicholson, Reynold A. A Moslem philosophy of religion. *Muséon* 33, 83-87, 1915. ISIS

Apropos of the Kitāb al-insān al-kāmil fī ma'rifat al awākhir wal-awā'il of 'ABD AL-KARĪM AL-JĪLĪ (c. 1365-c. 1420). See BROCKELMANN 2, 205; *Encycl. of Islam* 1, 46. G. S.

Pelliot, Paul. Notes additionnelles sur TCHENG HOUO et sur ses voyages. *T'oung pao* 31, 274-314, 1935. ISIS

Apropos of CHÊNG HO. G. S.

Pelliot, Paul. Les grands voyages maritimes chinois au début du XV^e siècle. *T'oung pao* 30, 237-452, 1933. ISIS

Apropos of J. J. L. DUYVENDAK, *Ma Huan re-examined*, Amsterdam, 1933, 74 pages (Verhandel. der Kon. Ak. van Wetensch., Afd. Letterkunde, N. R., d. XXXII, no. 3).

XVth Century (second half)

Cantera Burgos, Francisco. El judio salmantino ABRAHAM ZACUT. Notas para la historia de la astronomía en la España medieval. (Revista de la Academia de ciencias de Madrid 28). 350 p. Madrid, Bermejo, 1931. ISIS

Reviewed by RAPHAEL LEVY, *Revue des études juives* 92, 175-78, 1932.

Crawshay, L. R. Possible bearing of a luminous syllid on the question of the landfall of COLUMBUS. *Nature* 136, 559-60, 1935. ISIS

Diehl, Robert. ERHARD RATDOLT, ein Meisterdrucker des 15. und 16. Jhdts. 24 p., 56 fig. Wien, REICHNER, 1933. ISIS

Jane, Cecil. Select documents illustrating the four voyages of COLUMBUS, including those contained in R. H. MAJOR's select letters of CHRISTOPHER COLUMBUS. Translated and edited with additional material, an introduction, and notes. Vol. II. The third and fourth voyages. With a supplementary introduction by E. G. R. TAYLOR. LXXXIX + 164 p. (The Hakluyt Society.) London, the Society, 1933. ISIS

Reviewed by ERNEST W. NELSON, *American historical review* 41, 192, 1935.

Kremers, Edward. On the bone of the stag's heart. *Isis* 23, 256, 1935. ISIS

Extract from the *Novo receptario* (Florence, 1498).

Scholderer, V. An early French printed herbal. ***British Museum quarterly*** 9, 108-09, 1 pl., 1935. ISIS.

Le Grant herbier en francois, imprimé à Paris par PIERRE LE CARON " The text of the Grant Herbier differs entirely from that of other French herbals of the period in not being a more or less close adaptation of the ' Hortus sanitatis '." It is not known to have been printed more than twice in the fifteenth century, although it became popular in the first half of the sixteenth. The B. M. has just acquired one of the incunabula editions. G. S.

Tricot-Royer, Dr. Les os de CHARLES-le-Téméraire sont-ils restés à Nancy? Le duc était-il prognathe? 24 p. Paris, Aesculape (s. d.). ISIS

Tricot-Royer, Dr. La thériaque à Anvers. Une ordonnance du magistrat en 1499. 12 p. Anvers, VOS-VAN KLEEF, (s. d.). ISIS

Leonardo da Vinci

Clark, Kenneth. A catalogue of the drawings of LEONARDO DA VINCI in the collection of his Majesty the King at Windsor Castle. 2 vols. Cambridge University Press, 1935. ISIS

Gukovskij, M. A. Studien zur Technik der italienischen Renaissance. 1. Das Gewinde bei LEONARDO DA VINCI. *Archives of the history of science and technology*, vol. 5, 287-317, Leningrad, 1935 (in Russian with German summary). ISIS

XVIth Century (whole and first half)

A. — *Mathematics*

Cunha, Felix. HIERONYMUS CARDANUS. *American journal of surgery* 30, 191-202, 4 fig., 1935. ISIS

Michel, Henri. L'art des instruments de mathématiques en Belgique au XVI^e^ siècle. *Bulletin de la Société royale d'Archéologie de Bruxelles* no. 2, 65-79, pl., 1935. ISIS

B. — *Physical sciences and technology*

De Waard, C. Le manuscrit perdu de SNELLIUS sur la réfraction. *Janus* 39, 51-73, 3 fig., 2 pl., 1935. ISIS

Kahle, Paul. Nautische Instrumente der Araber im indischen Ozean. *Oriental studies in honour of* CURSETJI ERACHJI PAVRY, 176-84, 1933. ISIS

" Es ist ganz zweifellos, dass der *Muḥît* des SIDI 'ALI RE'IS für uns wesentlich an Interesse verloren hat, seit uns die von ihm benutzten arabischen Vorlagen zugänglich gemacht worden sind. Aber gerade Ausführungen wie diese hier müssen doch zeigen, dass es sich um einen ausserordentlich sorgfältig berichtenden, exakten und kenntnisreichen Seemann handelt, der jedenfalls seine Quellen mit Verständnis benutzt hat und dessen Ausführungen

für uns zumal in den Partien von grösstem Werte sind und ihre Bedeutung behalten, für die wir einstweilen die arabische Vorlage nicht haben. So scheint mir der *Muḥīṭ* des SIDI 'ALI RE'IS nicht ganz das Urteil zu verdienen, das GABRIEL FERRAND, im allgemeinen natürlich mit Recht, über dieses Werk gefällt hat."

Thorndike, Lynn. That AGOSTINO NIFO's " De falsa diluvii prognosticatione " was not published until December 24, 1519. *Romanic Review* 26, 118-21, 1935. ISIS

" The controversy concerning the conjunction of all the planets in Pisces in February, 1524, and prospect of a second flood, to which attention was called by GABRIEL NAUDÉ in 1645 and in which HELLMANN reckoned that 56 writers participated with at least 133 publications, has hitherto been represented as initiated in 1517 by the printing by AGOSTINO NIFO of his treatise *On the false prognostication of a deluge*. I propose to show that this work was rather first printed at Naples on Dec. 24, 1519, that it was not composed by NIFO until that year, and he probably derived the idea for it from a treatise dedicated to him by ALBERTUS PIGHIUS, or PIGGHE, of Kampen in Holland and composed and printed at Paris about March 18, 1519."

Wright, John K. Two fundamental geographical inventions. *Geographical review* 25, 511, 1935. ISIS

Apropos of A. POGO's paper on GEMMA FRISIUS in *Isis* 22, 469-506 1935.

C. — *Natural Sciences*

Bigelow, John. The so-called BARTHOLOMEW COLUMBUS map of 1506. *Geographical review* 643-56, 1935. ISIS

" In 1893 Freiherr R. VON WIESER published a pamphlet in which he attempted to show that certain sketch maps in a medieval codex in the Biblioteca Nazionale at Florence were based on a map by BARTHOLOMEW COLUMBUS dating from about 1506 that was subsequently lost. Although this theory had been suggested before VON WIESER's time, since then it has been widely accepted, and the sketch maps have been interpreted as directly reflecting the views of CHRISTOPHER COLUMBUS and his brother BARTHOLOMEW concerning the size of the earth and the general distribution of lands and seas. In the following discussion evidence will be presented to show that the sketches do not represent Columbian ideas exclusively and probably date from as late as 1522-1525. In addition, several incidental points in VON WIESER's pamphlet will be subjected to criticism."

D. — *Medical Sciences*

Farrington, Benjamin. VESALIUS on China-root. Extracts from the letter of ANDREAS VESALIUS to Dominus JOACHIM ROELANTS,

written at Ratisbon, 13th June 1546. Translated from the Latin. *Transactions of the Royal Society of South Africa* 23, 97-106, 1935. ISIS

Farrington, Benjamin. The life and work of ANDREAS VESALIUS. By HERMANN BOERHAAVE and BERNHARD SIEGFRIED ALBINUS. *Transactions of the Royal Society of South Africa* 19, 49-78, 1930. ISIS

Farrington, Benjamin. The last chapter of the *De fabrica* of VESALIUS entitled *Some observations on the dissection of living animals.* Translated from the Latin. *Transactions of the Royal Society of South Africa* 20, 14 p., 1931. ISIS

Schlueter, Robert E. Fact and fiction in the names and titles of PARACELSUS. *Annals of medical history* 7, 274-84, 1935. ISIS

Van Wyck, William. The sinister shepherd : a translation of GIROLAMO FRACASTORO's *Syphilidis sive de morbo gallico libri tres.* XXIV+88 p. Los Angeles, Primavera Press, 1934. ISIS

Reviewed by S. V. LARKEY, *Isis* 23, 454, 1935.

E. — *Alia*

Allen, Percy Stafford (1869-1933). ERASMUS : lectures and wayfaring sketches. XII+216 p. New York, Oxford Univ. Press, 1934. ISIS

Reviewed by PRESERVED SMITH, *American historical review* 40, 776, 1935.

(Erasmus). Opus epistolarum DES. ERASMI Roterodami. Denuo recognitum et auctum per P. S. ALLEN et H. M. ALLEN. Tom. 8, 1529-1530. Compendium vitae, P. S. ALLEN addidit H. W. GARROD. XLIV+516 p. New York, Oxford University Press, 1934. ISIS

Reviewed by PRESERVED SMITH, *American historical review* 41, 126-28, 1935.

Thomas, J. H. Town government in the sixteenth century. 188 p., 4 pl., figs. London, ALLEN & UNWIN, 1933. ISIS

Reviewed by S. V. LARKEY, *Isis* 23, 455-56, 1935.

XVIth Century (second half)

A. — *Mathematics*

Sanford, Vera. La *Disme* of SIMON STEVIN—the first book on decimals. *Mathematics teacher* 14, 321-33, 1921. ISIS

Sarton, George. The first explanation of decimal fractions and measures (1585). Together with a history of the decimal idea and a facsimile (no. XVII) of STEVIN's *Disme... Isis* 23, 153-244, facs., 1935. ISIS

B. — *Physical sciences and technology*

Buckminster. Thomas. An almanack and prognostication for the year 1598, made by THOMAS BUCKMINSTER 1598. With an introduction by EUSTACE F. BOSANQUET. XIV+facs. pages. (*Shakespeare Association facsimiles*, no. 8). Oxford University Press, 1935. ISIS

Luth, Olof. Nogre stycker aff thenn frije konst astronomia (Cod. Holm. D 77). Med inledning utgiven av HENRIK SANDBLAD. XXIV+91 p., 33 fig. (*Skrifter utgivna av K. Humanistiska Vetenskaps-Samfundet i Uppsala* 29, 4). Uppsala, ALMQVIST & WIKSELLS Boktryckeri, 1935. ISIS

Edition of a Swedish adaptation of SACROBOSCO, made in 1584 by OLAUS JONAE LUTH, professor at the University of Uppsala. The Swedish text represented by Stockholm Ms. D 77 has been very carefully edited by H. SANDBLAD who has added an introduction of 20 p., and many notes but no glossary. G. S.

C. — *Natural Sciences*

Bernard, Joseph (1866-1931). Le monument MICHEL SERVET de JOSEPH BERNARD. Avec un avant-propos de R. CANTINELLI suivi d'un catalogue complet de l'œuvre de JOSEPH BERNARD. Folio, 30 p., 18 pl. Paris, VAN OEST, 1932. ISIS

This monument to SERVETO was ordered from the sculptor JOSEPH BERNARD by his native city Vienne (Isère) in 1908 and completed by him four years later. It is a very elaborate monument the whole and details of which are here reproduced in 18 plates. G. S.

Emmart, Emily Walcott. An Aztec medical treatise, the Badianus manuscript (Codex Barberini, Latin 241). *Bulletin of the institute of the history of medicine* 3, 483-506, 7 pl., 1935. ISIS

" The Badianus manuscript is a sixteenth-century Mexican herbal composed in 1552 in the famous College of Santa Cruz at Tlaltelolco, Mexico City." " The Badianus manuscript holds the unique position of being the earliest written Aztec herbal as well as being the only one written by the Aztecs themselves. From the point of view of time it marks the beginning of herbal literature on this side of the Atlantic. To the list of native Aztec students of the College of Santa Cruz, who disintguished themselves in the field

of letters we add the names of MARTIN DE LA CRUZ and JUANNES BADIANUS. The volume is a lasting tribute to the teachings of Fr. BERNARDINO DE SAHAGUN and the brothers of the Francisco order who taught at Tlaltelolco during the first fifty years of its existence."

Emmart, Emily Walcott. Concerning the Badianus manuscript, an Aztec herbal, " Codex Barberini, Latin 241 " (Vatican Library). *Smithsonian misc. coll.* 94, 14 p., 4 pl., Washington, 1935. ISIS

This is a brief account, with samples of the contents, of the earliest herbal produced in America (1552) in the College of Santa Cruz in Mexico City by MARTIN DE LA CRUZ and JUANNES BADIANUS, native Mexican Indians, the latter from Xochimilco, the district of the floating gardens. The text is closely related to that of SAHAGUN the medical writer, but is a more completely organized treatise and deals with more plants. It is a description of the diseases of the natives of Mexico. The original contains 91 color sketches of plants accompanied by Aztec symbols. It deals with the materia medica of a people living in a tropical climate at an altitude of 9000 feet and was written within 31 years after the Conquest. C. A. K.

Heawood, Edward. An undescribed Elizabethan map. *Geographical Journal* 85, 453-6, 1935. ISIS

A map of the harbour of Rye, Kent, dated 1594, " May with confidence be attributed to PHILIP SYMONSON of Rochester. Is among the best specimens of manuscript maps of the period, of which not many have survived."
C. W. A.

Ley, Willy. KONRAD GESNER was right. *Natural history*, 149-55, fig., September 1935. ISIS

Lynam, E. W. Map of England by PETRUS PLANCIUS. *British Museum quarterly* 9, 111, 1935. ISIS

First edition 1592. This is a copy of the second edition, 1592 or 1593.
G. S.

(Ralegh, Sir Walter). A brief account of RALEGH's Roanoke Colony of 1585 being a guide to an exhibition commemorating the three hundred fiftieth anniversary of the planting of the first English colony in what is now the United States of America, and particularly describing the endeavours and accomplishments of the above-mentioned RALEGH, THOMAS HARIOT, JOHN WHITE, RICHARD HAKLUYT, THEODORE DEBRY and Sir FRANCIS DRAKE. Directed to the adventurers and favourers of the book-collecting game by the William L. Clements Library wherein the said exhibition may be viewed. 18 p., 2 port., map. Imprinted at Ann Arbor, 1935. ISIS

A charming booklet with contemporary illustrations including DEBRY's engraving of JOHN WHITE's map of Virginia, 1590. G. S.

D. — *Medical sciences*

Barrett, W. P. Present remedies against the plague, etc. With an introduction by W. P. BARRETT. XIX+facs. p. (*Shakespeare association facsimiles* no. 7). London, MILFORD, 1933. ISIS

This facsimile was made from the second edition (1603) because the earlier edition (1594) was quite unfit for reproduction; both editions are practically equivalent. G. S.

Goodall, E. W. A French epidemiologist of the sixteenth century. *Annals of medical history* 7, 409-27, 1 fig., 1935. ISIS

Apropos of GUILLAUME DE BAILLOU (d. 1616).

Greiner, J. Dinkelsbühler Arzt-Instruktion von 1556. *Archiv für Geschichte der Medizin und der Naturwissenschaften* 28, 123-25, 1935. ISIS

Nuyens, B. W. Th. De laatste tien jaren van VOLCHER COITER's leven. *Bijdragen tot de geschiedenis der geneeskunde* 15, 125-31, 1935. ISIS

Apropos of the Dutch anatomist VOLCHER COITER (1534-1576). Dealing with the last ten years of his life 1566-76. G. S.

Tricot-Royer, Dr. L'imprimeur PLANTIN et les sciences médicales. *Progrès médical* 30 p. (no date, received in July 1935). ISIS

Followed with a list of CHRISTOPHE PLANTIN's (c. 1520-c. 1589) medical publications, beginning with a book of PIERRE BELON in 1555 and ending with another book of the same author in 1589. G. S.

E. — *Alia*

Gifford, George. (d. 1620). A dialogue concerning witches and witchcraftes, 1593. With an introduction by BEATRICE WHITE. (*Shakespeare association facsimiles* no. 1). London, MILFORD, 1931. ISIS

From BEATRICE WHITE's interesting preface, " GIFFORD's work admirably exemplifies the unimaginative character of the popular witchcraft creed of the Elizabethan period. There were no sabbaths, no unholy sacraments and hideous feasts, no airy excursions to distant Blockulas, no abominable lycanthropy, no voyages to sea in sieves, no journeys to Elfland, no direct

liaison with the devil. GIFFORD's witches are just bad-tempered old women with a grudge against individuals or the world at large and the victims of their own spite. They have their imps or 'puckrels,' familiar spirits in the shape of cats, toads, weasels, and other vermin, and these they send forth to kill men and cattle, rewarding them with food and keeping them in pots of wool under their beds. One old lady with more imagination keeps her spirit in a hollow tree. GIFFORD is remarkable for his tolerance, humanity, and occasional good sense. Never for a moment does he doubt the existence of witches. With him, as with SCOT, it is not a question of *de existentia* but of *de modo existendi*. He regards witchcraft as a horrible machination of the devil to bring both accusers and accused to destruction. The devil is the Lord's executioner. His book is valuable because it is compiled not from foreign authorities like the *Malleus Maleficarum* and the work of WIERUS, but from honest observation of local gossip and an attendance on the witch trials of the time."

Reinach, Salomon (1858-1932). JOSEPH SCALIGER et les Juifs. *Revue des études juives* 88, 171-76, 1929. ISIS

XVIIth Century (whole and first half)

A. — *Mathematics*

Luria, A. Ein angeblicher Zirkelschluss bei CAVALIERI. *Archive, of the history of science and technology* vol. 5, 491-97, Leningrads 1935 (in Russian with German summary). ISIS

Thomas, W. R. JOHN NAPIER. *Mathematical gazette* 19, 192-205, 1935. ISIS

Discusses the probability that NAPIER was acquainted with the 1544 Basel edition of the Greek text of ARCHIMEDES : and that he framed the word logarithm from a passage in the *Psammites*. C. W. A.

B. — *Physical sciences and technology*

Gabrieli. Giuseppe. Qualche altra notizia sugli scritti e sulla vita di GIOVANNI ECCHIO Linceo. *Reale accademia nazionale dei Lincei*, Rendiconti della classe di scienze morali, storiche e filologiche, ser. 6, vol. 10, 479-508, facs., Rome, 1935. ISIS

Apropos of the Dutch astronomer and physician JAN VAN HEEK (JOHANNES ECKIUS), born at Deventer 1577, died c. 1620. G. S.

Jenkins, Rhys. The reverberatory furnace with coal fuel, 1612-1712. *Transactions of the Newcomen Society* 14, 67-81, 1933-34. ISIS

Read, John. The Frankfurt emblems : a research in 17th century alchemy. *Nature* 135, 967-68, 1935. ISIS

" The culminating event of the evening was the singing, possibly for the first time in three hundred years, of some unique alchemical music which Prof. READ encountered some time ago in his alchemical studies, and which has formed the subject of a recent research by F. H. SAWYER, lecturer in music in the University of St. Andrews."

C. — *Natural sciences*

Bushnell, David I., jr. The Manahoac tribes in Virginia, 1608. 56 p. (*Smithsonian miscellaneous collections* 94, no. 8). Washington, D.C., 1935. ISIS

D. — *Medical sciences*

Kellett, C. E. Sir THOMAS BROWNE and the disease called the Morgellons. *Annals of medical history* 7, 467-79, 1935. ISIS

Saussure, R. de. JEHAN TAXIL, auteur du premier traité sur l'épilepsie écrit en langue française. *Bull. de la société française d'hist. de la médecine* 29, 143-55, 1935. ISIS

Tricot-Royer, Dr. Les guérisseurs et les éclopés dans l'œuvre de QUAST (ob. 1647). 10 p. Anvers, Editions YPERMAN (s. d.) ISIS

Tricot-Royer, Dr. La bibliothèque de VOPISCUS FORTUNATUS PLEMPIUS, professeur de médecine au XVII^e^ siècle. *Recueil des mémoires couronnés et autres mémoires de l'Académie royale de médecine de Belgique* 22, 112 p., Bruxelles, 1925. ISIS

V. F. PLEMP, naquit à Amsterdam, étudia à Gand, Louvain et Leyde, et devint professeur de médecine à Louvain en 1634; il mourut en 1671. Sa bibliothèque fut vendue en 1672 " Elle se composait de : 768 livres de médecine; 238 ouvrages politiques, d'histoire et de littérature; 8 ouvrages en langue espagnole ou italienne; 23 ouvrages de littérature grecque et latine; 39 ouvrages de littérature orientale, inscrits au catalogue, plus une quantité d'autres non mentionnés; *Et varii Arabici, Chaldaici et Thalmudici qui hic non exprimuntur*. En tout, 1074 titres inscrits." (p. 7). L'auteur analyse et critique le catalogue de cette bibliothèque. G. S.

E. — *Alia*

Chalmers, Gordon Keith. Hieroglyphs and Sir THOMAS BROWNE. *Virginia quarterly review* 11, 547-60, 1935. ISIS

Powicke, F. M. Sir HENRY SPELMAN and the " Concilia." *Proceedings of the British Academy* 16, 345-79, 1930. ISIS

Rome, A. PINDARE ou KIRCHER? *Les études classiques* 4, 337-50, facs., 1935. ISIS

This valuable paper offers both a detailed criticism of PAUL FRIEDLÄNDER's " Die Melodie zu PINDARS erstem Pythischen Gedicht " (*Berichte Sächs. Akad.*, phil.-hist. Kl., 86 Bd., 4 Heft, 54 p., Leipzig, 1934) and a continuation of the arguments presented by A. ROME in his previous paper on the subject, " L'origine de la prétendue mélodie de PINDARE " (*Les études classiques*, 1, 3 ss., 1932). Another paper under a similar title " KIRCHER und PINDAR," by P. MAAS and J. MÜLLER-BLATTAU (*Hermes* 70, 101-06, 1935), discussed by A. ROME in a post scriptum, adds to the overwhelming evidence against the antiquity of KIRCHER's alleged sample of a Greek melody. As far as historians of Greek music and students of PINDAR are concerned, PINDAR may be held as not responsible for the fragment inserted by KIRCHER in the *Musurgia universalis*, v. 1, p. 541 and 542 (Rome, 1650). As far as the historians of XVIIth century science and the students of KIRCHER are concerned, the problem presented by pp. 541 and 542 ought to be considered not as an isolated puzzle but in its proper setting, along with other Kircheriana. " Ceux qui connaissent Tartarin savent bien que ce n'est pas un menteur; mais ils savent aussi qu'il faut faire attention lorsqu'il raconte un petit détail sensationnel, surtout si cela ne tire pas à conséquence." A. P.

Stimson, Dorothy. COMENIUS and the Invisible College. *Isis* 23, 373-88, 1935. ISIS

XVIIth Century (second half)

A. — *Mathematics*

Inglis, Alexander. The arc of a hyperbola. *Mathematical gazette* 19, 142-44, 1935. ISIS

A solution by JAMES GREGORY (1638-1675) in a letter to JOHN COLLINS, dated 1671, May 17th. C. W. A.

Newton, Sir Isaac. Mathematical principles of natural philosophy and his System of the world. Translated into English by ANDREW MOTTE in 1729. The translation revised, and supplied with an historical and explanatory appendix, by FLORIAN CAJORI. XXXVI+ 680 p., frontispiece, facs., figs. Berkeley, Cal., University of California Press, 1934. ISIS

Reviewed by G. S., *Isis* 23, 456-57, 1935; by A. POGO, *Astrophysical journal* 81, 359-60, 1935; and by E. H. NEVILLE, *Mathematical gazette* 19, 49-52, 1935 and an amendment 19, 134-5, 1935.

B. — *Physical sciences and technology*

Anderson, Paul Bunyan. BUCKINGHAM's chemist. *Times Literary supplement*, p. 612, October 3, 1935. ISIS

Apropos of Dr. PETER BELLON.

Brunet, Pierre. L'astronomie physique de 1687 à 1759. *Thalès* 1, 48-52, 1935. ISIS

Hamilton, Stanley B. The place of Sir CHRISTOPHER WREN in the history of structural engineering. *Transactions of the Newcomen Society* 14, 27-42, 5 fig., 1933-34. ISIS

Huygens, Christiaan. *Œuvres complètes.* Publiées par la Société hollandaise des sciences, tome 18. L'horloge à pendule ou à balancier de 1666 à 1695. Anecdota. 703 p., 129 fig. La Haye, NIJHOFF, 1934. ISIS

Nous avons rendu compte des volumes antérieurs de cette admirable collection dans *Isis* 5, 154-56; 21, 213-15. Elle constitue un monument sans égal à la gloire de HUYGENS, et aussi à la louange de l'éditeur aussi érudit que modeste, J. A. VOLLGRAFF, sans le dévouement duquel il n'existerait pas. Il suffira d'annoncer la publication d'un nouveau volume contenant les documents relatifs à l'horloge à pendule ou à balancier de 1666 à 1695. La pièce principale c'est *l'Horlogium oscillatorium* de 1673, l'un des grands classiques de la physique de tous les temps. Cette édition nouvelle est précédée par une introduction de 40 p. G. S.

James, T. E.; Gunther, R. T.; Andrade, E. N. da C. ROBERT HOOKE and his contemporaries. *Nature* 136, 603-04, 1935. ISIS

Krylov, A. N. NEWTON's theory of astronomical refraction. 69 p., 2 figs. Leningrad, USSR Academy of Sciences, Institute of the hist. of sc. and technol., 1935. ISIS

A valuable study based on a series of NEWTON's letters to FLAMSTEED, discovered in 1832 and published by FRANCIS BAILY in *An account of the Rev. John Flamsteed*, London 1835. On p. 141 of BAILY's book, appears NEWTON's preliminary table, *Tabula refractionum*, enclosed with his letter of Nov. 17, 1694. The final table is mentioned in his letter of March 15, 1694-5; KRYLOV shows that this table is identical with NEWTON's *Tabula refractionum siderum ad altitudines apparentes*, published by HALLEY in the *Philosophical Transactions* for 1721, vol. 31, p. 172, London, 1723. A. P.

MacPike, Eugene Fairfield. EDMOND HALLEY: the man. 5 p. London, TAYLOR and FRANCIS, no date. ISIS

MacPike, Eugene Fairfield. HALLEY, FLAMSTEED and NEWTON. *Notes and queries*, 3 p., June 22, 1935. ISIS

C. — *Natural sciences*

Neviani, Antonio. Un episodio della lotta fra spontaneisti ed ovulisti il padre FILIPPO BONANNI (1638-1725) e l'abate ANTON FELICE MARSILI (1653-1710). *Rivista di storia delle scienze mediche* 26, 211-32, 1935. ISIS

Wafer, Lionel. A new voyage and description of the Isthmus of America. With WAFER's *Secret report* (1698) and DAVIS's *Expedition to the gold mines* (1704). Edited by L. E. ELLIOTT JOYCE. LXXII + 222 p. London, Hakluyt Society, 1934. ISIS

Reviewed by J. A. WILLIAMSON, *Geographical journal* 85, 92-3, 1935. WAFER resided among the Cuna Indians for several years from 1680. His *Description* gives a full account of the Isthmus, its plants, animals and birds, and fullest of all, of the Cuna tribe. NATHANIEL DAVIS gives an account of an expedition to Darien in 1702. C. W. A.

Wieder, Frederik Caspar. Monumenta cartographica. Reproductions of unique and rare maps, plans and views, in the actual size of the originals; accompanied by cartographical monographs edited by F. C. WIEDER. Volumes 4 and 5. The Hague, NIJHOFF, 1932-33. ISIS

Reviewed by G. R. CRONE, *Geographical journal* 84, 361-2, 1934. The maps are from VINGBOON's *Atlas* and the *Secret atlas* of the Dutch East India Company. Includes the first perspective plan of New York, circa 1660. C. W. A.

D. — *Medical sciences*

Deichert, H. Aus LEIBNIZENS Freundeskreis. KONRAD BARTHOLD BEHRENS (1660-1736), ein niedersächsischer Arzt und Gelehrter. *Archiv für Geschichte der Medizin und der Naturwissenschaften* 28, 43-80, 1935. ISIS

Ferran, Come. La médecine de Lyon au XVII^e^ siècle. LAZARE MEYSSONNIER (1611-73), conseiller et médecin du roi et de S. A. R., docteur de l'Université de Montpellier, agrégé au Collège des médecins de Lyon. *Bulletin de la Société française d'histoire de la médecine* 29, 179-208, 1935. ISIS

Fraser-Harris, D. F. Sir JOHN COLBATCH—An early forgotten

antiseptic surgeon. *The medical press and circular*, 580-82, June 19, 1935. ISIS

"One of the earliest treatises recommending the use of antiseptics, without of course so naming them, is the 'Novum lumen chirurgicum,' the work of one Sir JOHN COLBATCH, curiously enough a member of the College of physicians (the date of the earliest use of the *word* antiseptic is 1750). The full title of this work is : 'Novum lumen chirurgicum, or a new light of surgery wherein is discovered a much more safe and speedy way of curing wounds than has hitherto been practised. Illustrated with several experiments made in Flanders in the year 1694 by JOHN COLBATCH, a member of the College of Physicians, London. Printed for DAN BROWN. 1704.' The 'experiments,' of which COLBATCH relates fourteen, we should now call 'clinical surgical cases.' This work was evidently written before 1704, because its author tells us it was dedicated to 'the King,' which must refer to WILLIAM III, as in 1704 Queen ANNE was on the throne."

Fulton, John F. A bibliography of two Oxford physiologists, RICHARD LOWER (1631-1691)—JOHN MAYOW (1643-1679). Reprinted from *The Oxford Bibliographical Society, Proceedings and Papers*, 4, 1-62, 1935. ISIS

FULTON's earlier bibliographies of ROBERT BOYLE and FRACASTORO have taught us to expect much from him in that kind of investigation. The present volume does not disappoint our expectations, on the contrary. As far as MAYOW is concerned it is a very valuable supplement to Prof. T. S. PATTERSON's study (*Isis* 15, 1931). Says the author : "PATTERSON contends of MAYOW that 'such views as were sound were not MAYOW's, whilst those which were MAYOW's were not sound'. This harsh estimate of MAYOW is in most respects merited, for from PATTERSON's work and, from the present study, the popularizer of 'spiritus nitro-aereus' emerges as an enthusiastic student, with undeveloped critical faculties, who summarized rather well the views of his contemporaries concerning respiration and combustion, but contributed little that was new himself. When he speculated concerning other physiological problems, such as the nature of rickets and causes of muscular contraction, he was completely dominated by Galenical physiology. LOWER, on the other hand, emerges as an independent and painstaking investigator whose work, for the most part original, was always brilliantly conceived. He revised his books with scrupulous care, and the many revisions and textual changes in the successive editions of *De corde* (which have not hitherto been recorded) indicate that his interest in experimental investigation continued long after he left Oxford."

It is a pleasure to hear that FULTON is preparing similar bibliographies concerning "THOMAS WILLIS, ROBERT HOOKE, and several others who played a prominent part in Oxford science during the Restoration", and thus building solid foundations for the study of the history of science in that golden age. G. S.

Mayow, John (d. 1679). Medico-physical works : a translation of the *Tractatus quinque medico-physici* printed in the Sheldonian theatre

in 1674, reissued by permission of the Alembic Club of Edinburgh to commemorate the experiments by which MAYOW, of Wadham College and afterwards Fellow of All Souls College in Oxford, first proved air to be a mixture of two kinds of gases, the one spiritus nitro-aereus (= oxygen) necessary both for combustion and for respiration, and another (= nitrogen) incapable of supporting combustion and respiration. XXIII+331 p. Oxford, 1926 (*Old Ashmolean reprints*, 5). ISIS

On MAYOW see T. S. PATTERSON's paper in *Isis* (15, 47-96, 504-46, 1931).

Tricot-Royer, Dr. L'amphithéâtre anatomique d'Anvers en 1660. 4 p. Anvers, DE VLIJT, 1923. ISIS

Tricot-Royer, Dr. La leçon d'anatomie d'Anvers. 11 p. Anvers, YPERMAN (s. d.). ISIS

Tricot-Royer, Dr. MARIE-ANNE DE LICHT, demoiselle de qualité, se voue aux soins des lépreux d'Anvers, en 1672. 6 p. Anvers, DE VLIJT, 1927. ISIS

Van de Ven, A. J. Geneeskundige archivalia. Een steensnijding in 1653. *Bijdragen tot de geschiedenis der geneeskunde* 15, 174-84, 1935. ISIS

Van den Ven, A. J. Een steensnijding in 1653. *Bijdragen tot de geschiedenis der geneeskunde* 15, 145-52, 1935. ISIS

Winslow, C.-E. A. A physician of two centuries ago : RICHARD MEAD (1673-1699) and his contributions to epidemiology. *Bulletin of the institute of the history of medicine* 3, 509-44, 1935. ISIS

E. — *Alia*

Ashmole, Elias (1617-92). The diary and will of ELIAS ASHMOLE, edited and extended from the original manuscripts by R. T. GUNTHER. 183 p., port. Oxford, 1927. (*Old Ashmolean reprints*, 2).

Evelyn, John (1620-1706). Fumifugium : or, the inconvenience of the aer, and smoake of London dissipated. Together with some remedies humbly proposed by J. E., Esq : to his Sacred Majestie, and to the Parliament now assembled. 49 p. London, GODBID, 1661. ISIS

First printed in 1661. Facsimile of the reprint 1772.

Gibson, James. JOHN LOCKE. *Proceedings of the British Academy* 19, 29-51, 1933. ISIS

Annual lecture on a master mind, Henriette Hertz Trust.

Pelliot, Paul. MICHEL BOYM. *T'oung pao* 31, 95-151, 1934. ISIS

Apropos of ROBERT CHABRIÉ, MICHEL BOYM jésuite polonais et la fin des Ming en Chine (1646-1662). Contribution à l'histoire des missions d'Extrême Orient, Paris, BOSSUET, 1935, 9-283, 1 pl.

Singer, Edgar A., jr. JOHN LOCKE. *Annals of medical history* 7, 341-50, 1935. ISIS

Tradescant, John (1608-62). Museum Tradescantianum: or A collection of rarities preserved at South-Lambeth near London. 73 p. London, GRISMOND, 1656 (*Old Ashmolean reprints*, 1). ISIS

This facsimile reprint of the Musaeum Tradescantianum, the Garden List excepted, was prepared by R. T. GUNTHER for the opening of the old Ashmolean Museum for the Lewis Evans Collection on May 5, 1925, and is now printed by FREDERICK HALL, printer to the University of Oxford, 1925.

Tricot-Royer, Dr. Une vente publique de livres à Anvers au XVII^e^ siècle (1673). 201-13, Compas d'Or, 1924. ISIS

Vieyra, D. Request door een zekere dochter, welke men voor een manspersoon wilde doen (door) gaan, aan den koning (van Frankrijk) overgeleverd. Maart 1693. *Bijdragen tot de geschiedenis der geneeskunde* 15, 197-99, 1935. ISIS

XVIIIth Century (whole and first half)

A. — *Mathematics*

Emch, Arnold F. The Logica demonstrativa of GIROLAMO SACCHERI. *Scripta mathematica* 3, 221-33, 1935. ISIS

Euler. Léonard (1707-83). Recueil des articles et matériaux en commémoration du 150^e^-anniversaire du jour de sa mort. 239 p., 6 facs. (Académie des sciences de l'URSS, Travaux de l'Institut de l'histoire de la science et de la technique, série 2, fasc. 1), Moscow, 1935. ISIS

L'Académie des sciences des républiques russes qui a déjà tant fait pour l'histoire des sciences (nous sommes obligés de parler d'elle dans chaque numéro d'*Isis*) se devait à elle même de célébrer la mémoire d'EULER, qui fut

peut-être le plus célèbre de ses membres. Ce beau volume, illustré de portraits et facsimiles contient les articles suivants : A. KRILOV. LÉONARD EULER; S. VAVILOV. L'Optique physique de LÉONARD EULER; N. KOŠLAKOV. Le calcul des variations de EULER; S. LURIA. EULER et son "Calcul des zéros"; B. VENKOV. Les travaux de LÉONARD EULER sur la théorie des nombres; G. KRUTKOV. Apropos de la Theoria par EULER; G. KRUTKOV. Sur un problème posé dans la Theoria motus par EULER; V. PAJEVSKY. Les travaux démographiques de LÉONARD EULER; S. LURIA. Correspondance scientifique inédite de LÉONARD EULER; S. ČERNOV. LÉONARD EULER et l'Académie des Sciences. G. S.

Euler, Leonhard. *Methodus inveniendi lineas curvas maximi minimive proprietate gaudentes, sive solutio problematis isoperimetrici latissimo sensu accepti.* 600 p. Lausannae 1744. Moscow. 1934. ISIS

Russian translation of that famous memoir of EULER a part of which *De curvis elasticis* was translated into English for *Isis* 20, 72-160, 1933 by W. A. OLDFATHER and others. See facsimile of titlepage *Isis* 20, 73. The Russian book is beautifully gotten up. G. S.

Fisher, R. A. Randomisation, and an old enigma of card play. *Mathematical gazette* 18, 294-7, 1934. ISIS

Recent progress in theory of randomisation provides a solution of the old paradox raised in the correspondence between P. R. DE MONTMORT and NICOLAS BERNOULLI on the rule of guidance in the game called 'Le Her'. C. W. A.

B. — *Physical sciences and technology*

Nordenmark, N. V. E. ANDERS CELSIUS, LINNÉ och den hundragradiga termometern. *Svenska Linné-Sällskapets Årsskrift* 18, 124-33, 1935. ISIS

The author "deals with the origin of the socalled Celsian thermometer. After having given us a retrospect of earlier efforts to create a scientifically satisfactory thermometer — that of NEWTON (1701), that of FAHRENHEIT (1724) &c. — he proves that the celebrated Swedish astronomer ANDERS CELSIUS became interested in the problem through LE MONNIER who took part in the expedition for mensuration of latitudes in Lapponia. The scale of CELSIUS is taken over from DE L'ISLE; the freezing point is at 100°, the boiling one at 0°. CELSIUS's own diaries are still preserved at the Observatory of Upsala; from them can be gathered the development of his experiments with thermometers of different types. In 1747 there suddenly appears a new one, bearing the name of its fabricator, the optician EKSTRÖM; it soon supplanted all other ones and became known as 'the Swedish thermometer'. Its freezing point is zero, the boiling one 100°. It was constructed by LINNAEUS himself. In Holland he probably met FAHRENHEIT and became interested in the thermometer problem, it being of great importance to him to be able to state with certainty the freezing point which is vital to all plants.

Already TH. M. FRIES has pointed out that in CLIFFORD's garden he seems to have made use of a thermometer, the freezing point of which was zero (cp. the title plate of the *Hortus Cliffortianus*). After his return to Sweden he continued his experiments, and in 1745 he demonstrated to the Senate of the University the thermometer constructed by himself. In a letter to SAUVAGE he says : 'Ego primus fui, qui parare constitui thermometra nostra, ubi punctum congelationis o et gradus coquentis aquæ 100.' It seems difficult to understand why this instrument came to be connected with the name of CELSIUS. Perhaps because it was well known that CELSIUS had occupied himself with thermometers; or maybe C. (= centigrade) was interpreted as meaning CELSIUS."

C. — *Natural Sciences*

Abenius, Margit. Allt är viktigt. En stiltendens hos LINNÉ. *Svenska Linné-Sällskapets Årsskrift* 18, 95-108, 1935. ISIS

Study on LINNAEUS' language entitled "Everything is important."

Brolén, C. A.; **Lönnberg, Einar.** LINNÉ's avhandling *Migrationes avium* 1757. Svensk översättning. Inledning och kommentar. *Svenska Linné-Sällskapets Årsskrift* 18, 23-58, 1935. ISIS

"Amongst the divisions of the animal realm LINNAEUS probably found the birds most interesting; and he also directed his attention towards the routes of migratory birds. In a dissertation called *Migrationes avium* (1757) he has put together his own observations on this topic as well as those of certain foreign authorities. This pamphlet is here presented in a Swedish translation with a commentary by E. LÖNNEBERG. L. surveys the Linnaean theories from the point of view of modern research, he himself being a prominent authority on the migrations of birds. The one question, upon which LINNAEUS obstinately clung to obsolete ideas, was that of the migration of the swallows; he, like most of his contemporaries and even scholars of the early 19th century, felt convinced that they hibernate on the bottom of lakes."

Fries, Rob. E. LINNÉ-växter i bergii herbarium. *Svenska Linné-Sällskapets Årsskrift* 18, 109-23, 1935. ISIS

Dealing with "Linnaean specimens within the herbarium collected by P. S. BERGIUS, a pupil of the great botanist," kept at the Hortus bergianus in Stockholm.

Hofsten, Nils von. Systema naturae ett tvåhundraårsminne. *Svenska Linné-Sällskapets Årsskrift* 18, 1-15, 1935. ISIS

Article written by Prof. N. VON HOFSTEN in celebration of the bicentenary of the publication of the *Systema Naturae*; its first edition was issued at Leyden in 1735. The author underlines the great importance to the researches of LINNAEUS of his sojourn in Holland. Swedish as well as cosmopolitan science is laid under an indelible obligation to the then Dutch

School of research and to those men who patronised the work of LINNAEUS, such as GRONOVIUS, BOERHAAVE and others.

"When LINNAEUS entered upon the stage there existed two foundations of systematizing, viz. RAY's idea of species and TOURNEFORT's genera plantarum. Certain efforts had been made but principles there were none. LINNAEUS, as is well known, introduced into scientific research the necessary principles and created order, method, and lucidity. The paper gives a comparison between the system of plants and that of animals of the *Systema Naturæ*. It is pointed out that the latter one is based on a more universal method; and the often repeated suggestion concerning the inferiority of the animal system is refuted. The much criticised class *Vermes* corresponds to the *Cryptogamia*. Both these classes represent what remains left after the classification of the thoroughly examined plants and animals. In the first (and second) edition of the *Systema Naturæ* the animal system is more differentiated, better worked out, and even more natural than that of plants.

"Dealing with the history of binominal nomenclature the author refutes the assumption according to which it was founded by BAUHINUS, and suggests that is was announced already in the first edition of the *Systema* — especially in the regnum animale. The somewhat detailed exposition results in the suggestion that the unsophisticated names of species within the first edition have rather imperceptibly developed into the final ones; and to a great extent they have been transferred in an unaltered shape into the binominal nomenclature of the system. As for the plants conditions are fairly different, though a certain parallel development can be observed.

"The author winds up with an analysis of LINNAEUS's idea of species and of the foundations of his system, which is an idealistic one going back to the Platonic doctrine of ideas. Later on LINNAEUS arrived at the conclusion that within each genus the species had come into light through hybridization. The learned author believes that this idea, which partly meant a dissolution of the idealistic basis of the Linnaean system, can be traced already with the editio princeps of the *Systema Naturæ*."

Hult, O. T. Om LINNÉ och "Den osynliga världen." *Svenska Linné-Sällskapets Årsskrift* 18, 16-22, 1935. ISIS

"In the last issue of the Year-book Dr. O. HULT dealt with LINNAEUS's relations to microscopic research. He now continues his article with exposition of the ideas of LINNAEUS concerning living organisms, invisible to the eye, which are producers of diseases, 'contagia viva'. The author also indulges in a rapid survey of earlier authors, from the time of VARRO on."

Schmid, Günther. MATTHISSON und LINNÉ. 56 p. (*Germanische Studien* 163). Berlin, EBERING, 1935 (RM. 3.60). ISIS

The poet MATTHISSON (1761-1831) enjoyed some fame, and SCHILLER said of him "Dreierlei Erfordernisse landschaftlicher Darstellungen vereinigt Herr MATTHISSON in den meisten seiner Schilderungen. Sie gefallen uns durch ihre Wahrheit und Anschaulichkeit; sie ziehen uns an durch ihre musikalische Schönheit : sie beschäftigen uns durch den Geist, der darin atmet." The present memoir contains a brief biography; investigates

MATTHISSON's references to LINNAEUS, his relationship to G. F. HOFFMANN, G. RADDI and K. SPRENGEL, and his botanical activities. G. S.

Somerville, (Vice-Admiral) Boyle. Commodore ANSON's voyage into the South Seas and around the world. XVIII+318 p. London, HEINEMANN, 1934. ISIS

Reviewed J. A. WILLIAMSON, *Geographical journal* 86, 80-1, 1935. "The first authoritative account based on thorough research." C. W. A.

Sweet, Jessie M. Sir HANS SLOANE : life and mineral collection. *Natural history magazine* 5, 49-64, 97-116, 1935. ISIS

Killyleagh, County Down, 1660.4.16 : Chelsea, London, 1753.1.11. Portraits and illustrations. C. W. A.

Uggla, Arvid Hj. LINNÉS almanacksanteckningar för år 1735, med inledning och förklaringar. *Svenska Linné-Sällskapets Årsskrift* 18, 134-48, 2 facs., 1935. ISIS

"The year 1735 was of importance to LINNAEUS not only because of the publication of the *Systema naturæ*. At the new Year in Falun he became engaged to be married; and shortly afterwards he started upon his journey through Hamburg to Holland. At Harderwijk he put forth his thesis for the doctorate, and afterwards at Amsterdam and Leyden he made the acquaintance of men like BOERHAAVE, BURMANNUS and GRONOVIUS. It is highly interesting that a very personal document from this year has been preserved, viz. the calendar into which he entered short notes of his experiences. These notes were published in 1845, the year in which they were unearthed; however, they are now reprinted with commentatory remarks."

D. — *Medical sciences*

Faucci, Ugo. Contributo alla storia della " Dottrina parassitaria delle infezioni," sua connessione colla scoperta dell " Origine acarica della scabbia." *Rivista di storia delle scienze mediche* 26, 136-45, 243-64, 1935. ISIS

Lemay, P. Une correspondance de PHILIPPE HECQUET. *Bull. de la société française d'histoire de la médecine* 29, 209-24, 1935. ISIS

Marconi, Enzo. In margine al centenario Ramazziniano. Un geniale collega del RAMAZZINI : FRANCESCO TORTI (1658-1741). *Rivista di storia delle scienze mediche* 26, 123-35, 6 fig., 1935. ISIS

Tricot-Royer, Dr. Lepra hujus patriae. Les visitations des " lépreux " d'Anvers de 1730 à 1782. 11 p. Anvers, DE VLIJT, 1929. ISIS

Van der Hoeven, J. De medicijnen van Juffrouw JOANNA STEPHENS tegen den steen in de blaas. *Bijdragen tot de geschiedenis der geneeskunde* 15, 131-36, 1 facs., 1935. ISIS

Tricot-Royer, Dr. La " lèpre " d'Anvers au XVIII^e siècle. *Yperman, Bull. de la société belge d'histoire de la méd.* 2, 5-12, 1928. ISIS

Townsend, Eleanor Winthrop. WILLIAM BULL, M. D. (1710-1791) Lieutenant-governor of South Carolina under the royal government. *Annals of medical history* 7, 311-22, 4 fig., 1935. ISIS

E. — *Alia*

Mornet, Daniel. Les origines intellectuelles de la révolution française, 1715-1787. 552 p. Paris, COLIN, 1933. ISIS

Reviewed by G. S., *Isis* 23, 463-67, 1935.

Mornet, Daniel. Les sciences de la nature en France, au XVIII^e siècle. Un chapitre de l'histoire des idées. X+291 p. Paris, COLIN, 1911. ISIS

Reviewed by G. S., *Isis* 23, 463-67, 1935.

Stroh, Alfred H.; Ekelöf, Greta. An abridged chronological list of the works of EMANUEL SWEDENBORG. Including manuscripts, original editions and translations prior to 1772. 54 p. Uppsala, ALMQVIST & WIKSELL, 1910. ISIS

Reviewed by G. S., *Isis* 23, 459-63, 1 facs., 1935.

Swedenborg, Emanuel. Opera quaedam aut inedita aut obsoleta de rebus naturalibus. Nunc edita sub auspiciis Regiae Academiae Scientiarum Suecicae. Holmiae, ex officina Aftonbladet, 3 vols., 1907-11. I. Geologica et epistolae, LI+344 p., port., figs., 1907; II. Cosmologica, XXXV+373 p., port., figs., 1908; III. Miscellanea de rebus naturalibus, XXXVII+328 p., figs., 1911. ISIS

Reviewed by G. S., *Isis* 23, 459-63, 1935.

(Swedenborg). EMANUELIS SWEDENBORGII Itineraria. Editio tertia emendata. Resebeskrifningar af EMANUEL SWEDENBORG under åren 1710-1739. 97 p. Utgifna af Kungl. Vetenskapsakademien den 19 November 1910. ISIS

Reviewed by G. S., *Isis* 23, 459-63, 1 facs., 1935.

XVIIIth Century (second half)

A. — *Mathematics*

Archibald, R. C. BURROW's or CARNAN's diary. *Mathematical gazette* 19, 222-23, 1935. ISIS

Bibliographical note on *The lady's and gentleman's diary*, edited by REUBEN BURROW (1747-1792) and published by THOMAS CARNAN for the years 1776-1788. C. W. A.

Floyd, W. F. Graphical representation of complex numbers. *Nature* 136, 224, 1935. ISIS

Apropos of WESSEL's memoir of 1797. G. S.

Polak, L. S. LAGRANGE et le principe de la moindre action. *Archives of the history of science and technology*, vol. 5, 155-81, Leningrad, 1935 (in Russian with French summary). ISIS

B. — *Physical sciences and technology*

Albion, Robert G. The communication revolution, 1760-1933. *Transactions of the Newcomen Society* 14, 13-25, 1933-34. ISIS

Archangelskij, P. A hydraulic machine in the estate " selo arkhangelskoie." *Archives of the history of science and technology* 6, 171-85, 1935 (in Russian with English summary). ISIS

"The water-raising machine in the 'selo Arkhangelskoie is the latest technical modification of the screw of ARCHIMEDES in the 18th century. The mathematician DANIEL BERNOULLI gave the idea of its construction in 1773. His project was first realized in the form of a model in Florence in 1779. Six years later the Swedish naval engineer NORBERG constructed to the order of the Russian prince N. A. COLITZIN a large machine after this model for supplying the prince's kitchen gardens and stables with water."

Black, Joseph. Inaugural dissertation. Translated from the Latin by CRUM BROWNE, communicated by LEONARD DOBBIN. *Journ. Chem. Education* 12, 225-28, 268-73, 1935. ISIS

On the acid humour arising from food. On Magnesia alba. T. L. D.

Charliat, Pierre-Jacques. L'Académie royale de Marine (1752) et la révolution nautique au XVIII^e siècle. *Thalès* 1, 71-82, 1935. ISIS

Dormidontov, N. Les bateaux mécaniques de I. P. KOULIBINE (d'après les documents inédits.) *Archives of the history of science and technology* vol. 5, 319-59, Leningrad, 1935 (in Russian, with French summary). ISIS

"Cet article présente un aperçu des étapes principales de l'activité du célèbre inventeur russe IVAN PETROVIČ KOULIBINE (né le 10 Avril 1735, mort le 30 Juin 1818), en tout ce que concerne son invention en Russie du premier bateau à mouvement automatique. Parmi les travaux de I. P. KOULIBINE cette invention occupe une des places principales au point de vue de son importance technique ainsi qu'au point de vue du temps et des efforts qu'il lui a consacrés (de 1782 à 1807). L'invention KOULIBINE assurait le mouvement du bateau contre le courant, ce mouvement étant stimulé par le courant lui-même, et devait remplacer le transport pratiqué à cette époque par chevaux ou par hommes (les bourlaques). La priorité de cette invention n'appartient pas à KOULIBINE; la même principe de mouvement avait été représenté par un mécanisme, inventé par le professeur d'hydrographie, le jésuite CLAUDE FRANÇOIS MILLIET DE CHALES (Dechales), né en 1621 (d'après d'autres sources en 1611 ou 1624), et mort en 1673. Ce principe de mouvement mécanique est décrit dans son œuvre *L'art de naviguer*, Paris, 1677."

Gliozzi, Mario. GIAMBATISTA BECCARIA nella storia dell'elettricità. *Archeion* 17, 15-47, 1935. ISIS

Kamenskij, V. A. A model of the Petrozavodsk blast furnace with cylindrical blower of 1776. *Archives of the history of science and technology* 6, 333-48, 1935 (in Russian with English summary). ISIS

Kamenskij, V. A. Die schwedische Metallurgie des XVIII. Jahrhunderts in den Gemäden von Hilleström. *Archives of the history of science and technology* vol. 5, 507-34, Leningrad, 1935 (in Russian, with German summary). ISIS

Karguine, D. Le " perpetuum mobile " de I. P. KOULIBINE. *Archives of the history of science and technology* 6, 187-209, 1935 (in Russian with French summary) ISIS

"Cet article donne des renseignements qui caractérisent l'activité de KOULIBINE, comme inventeur et constructeur. L'auteur décrit les conditions dans lesquelles son activité de créateur lui a suggéré le projet de l'invention d'un perpetuum mobile. L'idée surprenante de construire une machine, qui pourrait devenir un bienfait pour le gouvernement et le peuple, séduisit l'inventeur autodidacte et devint le but principal de sa vie, auquel il voua tout son loisir et toutes ses pensées secrètes. Les premiers échecs subis provoquèrent ses doutes de la justesse de cette idée et lui firent demander les avis des autorités de la science contemporaine. L'opinion favorable de l'illustre mathématicien, L. EULER, lui parut suffisante. Les réponses

négatives des autres savants furent reçues comme des opinions de personnes peu mûres pour la conception d'idées géniales. Le manque d'éducation, les opinions flottantes du milieu qui l'entourait et sa volonté intrépide de fanatique lui firent dépenser tout son argent et même faire des dettes, — mais n'arrivèrent point à lui suggérer la fausseté d'une idée, à laquelle il avait voué plus de 40 ans de sa vie; il continuait avec une persévérance remarquable d'étudier et de projeter toutes sortes de variantes d'une machine à mouvement perpétuel."

Lemay, P. Supplément à l'iconographie française de LAVOISIER. *Bull. de la société française d'histoire de la médecine* 29, 163-64, 1935. ISIS

McKie, Douglas; Heathcote, Niels H. de V.. With a foreword by E. N. DA C. ANDRADE. The discovery of specific and latent heats. 151 p., 6 pl., 2 fig. London, ARNOLD, 1935 (6 s.). ISIS

Elucidation of one of the most important chapters in the history of physics in the XVIIIth century. The authors have made a very elaborate study of the sources. JOSEPH BLACK continued the investigations of BOERHAAVE and GEORGE MARTINNE with considerable perspicacity and genius. "He had formulated his doctrine of specific heat in 1760 and that of latent heat shortly after this; he carried out the first determination of the latent heat of fusion of ice in December, 1761, and read an account of these experiments to the Literary and Philosophical Society of the University of Glasgow on April 23rd, 1762; and he made the first determination of the latent heat of vaporization of water on October 4th, 1762, and the first determination of the latent heat of condensation of steam on October 9th, 1764, IRVINE assisting him in the latter research. And it will be shown below that he was the first investigator to formulate theoretical explanations of these phenomena and to test his theories by the necessary quantitative experiments." (p. 35) His discoveries were not published until four years after his death, by his disciple JOHN ROBISON : *Lectures on the elements of chemistry* (2 vols., Edinburgh 1803), but they were known much before that time being applied by JAMES WATT to his fundamental improvement of the steam engine. They were also known to continental scientists at least since 1772, through a number of the journal edited by abbé ROZIER. The investigations of the Swede JOHAN CARL WILCKE (1732-96) were posterior to BLACK's and inferior, e. g., he never studied the latent heat of vaporization, but they were published more promptly (latent heat 1772, specific heat 1781). The steps leading to these discoveries are investigated with great precision : JEAN MORIN 1661, GEORG WOLFFGANG KRAFFT 1744, G. W. RICHMANN 1744-47, H. BOERHAAVE 1732, J. C. WILCKE 1772 for latent heat; WILCKE 1781 and the Finnish chemist JOHAN GADOLIN for specific heat. A final chapter deals with the immediate consequences of those discoveries : the application to the steam engine being simply indicated; rise and progress of calorimetry; attempts to determine the zero of temperature; " weighth of heat ".

This handsome little volume illustrated with six portraits, is a model of its kind. G. S.

Quintana i Mari, Antoni. ANTONI DE MARTI I FRANQUES (1750-

1832). Memòries originals, estudi biogràfic i documental. 309 p., 3 pl., 9 facs. (*Memòries de l'Acadèmia de ciències i arts de Barcelona*, 24). Barcelona, Nebots de LOPEZ ROBERT I C.ª, 1935. ISIS

This splendid publication was planned to celebrate the centenary of MARTI's death but was a little delayed by various circumstances. It includes a new edition of his three fundamental memoirs :

Memoria sobre algunas producciones que resultan de la combinación de varias substancias aeriformes; *Memoria sobre la cantidad de aire vital que se halla en el aire atmosférico y sobre varios métodos de conocerla*; and *Experimentos y observaciones sobre los sexos y fecundación de las plantas*, which were submitted respectively in 1787, 1790, and 1791 to the Academy of sciences and arts of Barcelona of which MARTI was a member for forty-six years. This is followed by an elaborate biography and studies of MARTI's activities as a meteorologist, botanist, chemist and philosopher. A number of documents concerning MARTI and Mss of his are here published for the first time. The book is beautifully illustrated and well indexed. The author has been awarded a prize by the Institut d'estudis catalans for this book which is a fitting monument for one of Catalonia's noblest sons. G. S.

Raskin, N. M. La machine pour la fabrication du papier et son inventeur NICOLAS LOUIS ROBERT. *Archives of the history of science and technology* vol. 5, 361-80, Leningrad, 1935 (in Russian with French summary). ISIS

" La machine à fabriquer le papier occupe une place toute particulière parmi les mécanismes nombreux de l'époque de la révolution industrielle. La machine, proposée par le constructeur français NICOLAS LOUIS ROBERT (1761-1828) a été la première machine pour la production du papier, dont nous trouvons des mentions dans l'histoire. C'est dans ce mécanisme qu'on été incorporés pour la première fois dans la technique industrielle deux principes techniques fondamentaux : celui de la continuité et celui de l'automatisme."

Rutherford, Daniel (1749-1819). Inaugural dissertation. Translated from the Latin by CRUM BROWNE, communicated by LEONARD DOBBIN. *Journ. Chem. Education* 12, 370-74, 1935. ISIS

On the air called fixed, or mephitic. T. L. D.

Weeks, Mary Elvira. The discovery of tellurium. *Jour. Chem. Education* 12, 403-09, 6 fig., Sept. 1935. ISIS

" Some letters of KLAPROTH and KITAIBEL which have been carefully preserved in the Hungarian National Museum at Budapest for more than a century shed new light on the early history of the element tellurium and reveal the characters of Baron FRANZ JOSEPH MÜLLER VON REICHENSTEIN, who discovered it in the gold ores of Transylvania, of PAUL KITAIBEL, who rediscovered it, and of MARTIN HEINRICH KLAPROTH, who named it and made it known to the scientific world." An account of the men and events, with English translations of the letters. T. L. D.

Zabarinskij, P. P. The unpublished correspondence on WATT and BOULTON. *Archives of the history of science and technology* vol. 5, 535-44, Leningrad, 1935 (in Russian with English summary). ISIS

C. — *Natural sciences*

Gorsse, Bertrand de. Un hydrologue inconnu du XVIII[e] siècle, LAMOIGNON DE MALESHERBES (1721-94) ministre et défenseur de LOUIS XVI. *Bull. de la société française d'histoire de la médecine* 29, 225-28, 1935. ISIS

Kudrjavzev, F. A. Aus der Geschichte der Erforschung Transbaikaliens (Materialien über die Expedition der Akad. PALLAS und GEORGI). *Archives of the history of science and technology*, vol. 5, 569-77, Leningrad, 1935 (in Russian with German summary). ISIS

Apropos of P. S. PALLAS and J. G. GEORGI.

Larsen, Esther Louise. PEHR KALM's description of maize, how it is planted and cultivated in North America, together with the many uses of this crop plant. Introduction and translation. *Agricultural history* 9, 98-117, 1935. ISIS

"Among the most important sources for the history of American colonial agriculture are the accounts left by the few visitors who were trained scientists. Among these records is an obscure article by the celebrated botanist, PEHR KALM, which is here translated from the Swedish for the first time. It appeared in two parts in Swedish in 1751-52." "As a statement of agricultural practices in the cultivation of corn the article is considered one of the most complete as well as one of the earliest. KALM was extremely enthusiastic about the possibilities of maize as an economic crop because it could be used so advantageously by both man and beast."

Lieven, Eleanor. The English in Kamchatka. 1779. *Geographical journal* 84, 417-9, 1934. ISIS

The visit of Captain CHARLES CLERKE in command after Captain COOK's death on his third voyage. C. W. A.

Rodd, Francis Rennell. RENNELL's comments upon the journeys of PARK and LAING to the Niger. *Geographical journal* 86, 28-31, 1935. ISIS

"It appears that GEORGE BARNES, the English governor of Senegal, had learnt as early as 1764, that the course of the Niger at Timbuctu was from west to east." C. W. A.

Roule, Louis. BUFFON et la description de la nature. 248 p. Paris, FLAMMARION, 1924. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 264-65, 1935.

Roule, Louis. BERNARDIN DE SAINT-PIERRE et l'harmonie de la nature. 242 p. Paris, FLAMMARION, 1930. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 265-66, 1935.

Schmid, Günther. Der Bauernbotaniker ADAM DIETRICH (1711-1782), in seiner Zeit. *Mitteilungen des Thüringischen Botanischen Vereins* 42, 107-32, 1935. ISIS

Stenström, Fritz. PEHR OSBECK och LARS MONTIN. Två halländska Linnélärjungar. Föredrag vid Svenska Linné-Sällskapets sammanträde den 26 november 1934. *Svenska Linné-Sällskapets Årsskrift* 18, 59-94, 1935. ISIS

Biographies of PETER OSBECK (1723-1805) and LARS MONTIN (1723-85), two pupils of LINNAEUS who both spent the best part of their active age in Halland and also investigated the flora of this province. OSBECK, acting as a chaplain, in his youth went on one of the ships of the Swedish East India Company to China and has published a description of his tour. His name is commemorated by the plant *Osbeckia chinensis*. Later on he became domestic chaplain to Count C. G. TESSIN, the great patron of art and literature who was also vastly interested in the natural sciences. Finally he was nominated Rector of a parish in southernmost Halland. MONTIN, on the exhortation of LINNAEUS, went through Lapponia along the way formerly trodden by his teacher; the results of his researches are contained in two dissertations, viz. on the moss *Splachnum* and on the medical treatments prevailing amongst the Lapps. He died as physician of the province Halland. THUNBERG, in commemoration of MONTIN, nominated the genus *Montinia*."

Taranovič, V. P. The travels of I. I. LEPEKHIN, member of the Academy of sciences, over White Russia and Livonia in 1773. *Archives of the history of science and technology* vol. 5, 545-68, Leningrad, 1935 (in Russian with English summary). ISIS

D. — *Medical sciences*

Dock, George. ROZIERE DE LA CHASSAGNE and the early history of percussion of the thorax. *Annals of medical history* 7, 438-50, 4 fig., 1935. ISIS

Guiart, J. Documents iconographiques relatifs à J.-C. GILIBERT (1741-1814). *Bull. de la soc. franç. d'hist. de la méd.* 29, 117-19, 1935. ISIS

Hines, E. A., jr. HUGH WILLIAMSON, M. D., LLD. (1735-1819), North Carolina physician, statesman, and historian. *Annals of medical history* 7, 323-26, 2 fig., 1935. ISIS

Laignel-Lavastine, M.; Dhotel, Yves. Contribution à la clinique historique : note psychiatrique sur JOSEPH LE BON (1765-95). *Bull. de la société française d'histoire de la médecine* 29, 229-32, 1935. ISIS

Mercier, Raoul. PIERRE-PAUL CLEMENCEAU, officier de santé de l'armée de l'Ouest (1749-1825). *Bull de la soc. franç. d'hist. de la méd.* 29, 70-76, 1935. ISIS

Viets, Henry R. DOMENICO COTUGNO : his description of the cerebrospinal fluid, with a translation of part of his *De ischiade nervosa commentarius* (1764) and a bibliography of his important works. *Bulletin of the institute of the history of medicine* 3, 701-38, 18 fig., 1935. ISIS

E. — *Alia*

Liubimenko, I. La fondation de l'Académie russe. *Archives of the history of science and technology* 6, 97-116, 1935 (in Russian with French summary). ISIS

" L'Académie Russe fut fondée à Saint-Pétersbourg en 1783, plus d'un demi-siècle après la fondation de l'Académie des Sciences. De même que l'Académie française, elle devait cultiver la langue nationale en s'occupant de sa grammaire, en établissant des règles de versification et de rhétorique et en élaborant, à l'exemple de la France, un dictionnaire. Ce fut la princesse CATHERINE DACHKOV, directeur de l'Académie des Sciences à cette époque, qui devint premier président de cette nouvelle Académie. Dans ses mémoires elle s'est même attribuée l'initiative de la fondation de l'Académie Russe. Cependant l'étude plus approfondie de cette question montre, que, dès 1735 déjà, des efforts avaient été tentés pour organiser des études russes philologiques, d'abord à l'Académie des Sciences même et plus tard à l'Université de Moscou. 'L'Assemblée russe libre,' qui y avait été fondée en 1771, avait inclus dans son programme l'élaboration d'un dictionnaire et avait publié des traductions et des compositions russes en vers et en prose, qui avaient contribué au développement de la langue nationale. La princesse DACHKOV avait été un des membres actifs de cette société qui était tombée en décadence au moment de la fondation à Saint-Pétersbourg de l'Académie Russe."

Van der Klaauw, C. J. Die Bedeutung der Teleologie KANTS für die Logik der Ökologie. *Archiv für Gesch. d. Med. u. d. Naturw.* 27, 516-88, 1935. ISIS

XIXth Century (whole and first half)

A. — *Mathematics*

Buxton, L. H. Dudley. CHARLES BABBAGE (1792-1871) and difference engines. *Transactions of the Newcomen Society* 14, 43-65, 2 fig., 1933-34. ISIS

Ducassé, P. La pensée mathématique d'AUGUSTE COMTE. *Thalès* 1, 133-43, 1935. ISIS

Emch, Arnold. GAUSS and the French Academy of science. *American mathematical monthly* 42, 382-83, 1935. ISIS

Geppert, Harald. GAUSS's *Disquisitiones arithmeticae* and the French Academy of sciences. *Scripta mathematica* 3, 285, 1935. ISIS

Schaefer, Clemens. Ein Briefwechsel zwischen GAUSS, FRAUNHOFER und PASTORFF. *Nachr. Ges. Wiss. Göttingen, Jahresber.* 57-75, 1933-34. ISIS

Verriest, G. EVARISTE GALOIS et la théorie des équations algébriques. 58 p. Louvain, GAUTHIER-VILLARS, 1934. ISIS

Reviewed by W. E. H. BERWICK, *Mathematical gazette* 19, 154-55, 1935. An account of the life of GALOIS and a summary of the theory of algebraic equations as known before his investigations. C. W. A.

B. — *Physical sciences and technology*

Bathe, Greville. OLIVER EVANS (1755-1819) and the mystery of his "Orukter Amphibolos." *Transactions of the Newcomen Society* 14, 109-17, 1933-34. ISIS

Body, J. H. R. A note on electro-magnetic engines. *Transactions of the Newcomen Society* 14, 103-07, 1933-34. ISIS

Carr, David P. Side lights on the high peak railway. *Transactions of the Newcomen Society* 14, 179-81, 1 fig., 1933-34. ISIS

Collard, Auguste. ADOLPHE QUETELET et l'astronomie. *Ciel et Terre*, nos. 6, 7, 8, 10 p., 1935. ISIS

Cook, Elton S. Dr. JAMES DASCOMB. *Jour. Chem. Education* 12, 111-14, 1935. ISIS

JAMES DASCOMB (1808-1880), a graduate in medicine from Dartmouth College in 1833 was the first professor of chemistry at Oberlin College in Ohio where he taught from 1834-1878. The present paper is not a biography of DASCOMB but shows us " the sort of man who pioneered in chemical education, the kind of chemistry he taught, and how and under what conditions he taught it." T. L. D.

Demoulin, A. ADOLPHE QUETELET, fondateur de l'Observatoire royal de Belgique. *Bulletin astronomique de l'Observatoire royal de Belgique* 2, 12-13, 1935. ISIS

(Faraday, Michael). FARADAY's diary. Being the various philosophical notes of experimental investigation made by MICHAEL FARADAY D. C. L., F. R. S., during the years 1820-1862 and bequeathed by him to the Royal Institution of Great Britain. Now, by order of the Managers, printed and published for the first time, under the editorial supervision of THOMAS MARTIN. With a foreword by Sir WILLIAM H. BRAGG. Vol. VI, Nov. 11, 1851 — Nov. 5, 1855. XIV+495 p., 7 pl., frontispiece. London, BELL, 1935 (£ 12.12.0 per set of seven volumes). ISIS

The first volumes of this magnificent publication have been elaborately reviewed in *Isis* 20, 472-74; 22, 252-53; 23, 509. It will suffice to indicate its progress. The frontispiece represents FARADAY giving one of the Christmas juvenile lectures at the Royal Institution in 1855-6, a number of famous persons of that time being recognisable in the audience. G. S.

Lippmann, Edmund O. von. F. F. RÜNGE und GOETHE. *Der Deutsche Chemiker* Nr. 2, 1 p., 1935. ISIS

Lippmann, Edmund O. von. Vor hundert Jahren (XIV). *Zeitschrift Die Deutsche Zuckerindustrie* Nr. 1, 29 ff., 1935. ISIS

McCay, C. M. Iodized salt a hundred years ago. *Science* 82, 350, 1935. ISIS

" In the year 1833, there appeared an article by the French chemist, BOUSSINGAULT, in which he described the value of iodized salt in the prevention of goiter."

McKie, Douglas. DAVY's experiment's on the frictional development of heat. *Nature* 135, 878, 1935. ISIS

Mittasch, A. BERZELIUS und die Katalyse. Zum Gedächtnis der Aufstellung des Katalyse-Begriffes 1835. 23 p., Leipzig, Akademische Verlagsgesellschaft, 1935 (RM. 1.50). ISIS

The concept of catalysis has been variously discussed and debated, but the highly pragmatic original concept of BERZELIUS now remains as good as ever. " Und indem gegen Ende seines Lebens (in seinem *Lehrbuch* Bd. 4, S. 53, 1847) BERZELIUS von dem Rätsel des Lebens redet, ' welches wir niemals lösen werden, 'fährt er fort : ' Inzwischen erlauschen wir doch hie und da Etwas von seinen Geheimnissen, und wie weit wir damit bei einer fleissigen Forschung in Zukunft kommen können, kann niemand voraussehen. Eines von diesen erlauschten Geheimnissen glauben wir in der Anwendung gefunden zu haben, welche die lebende Natur von der katalytischen Kraft zu machen scheint. Ich meine, diese Worte aus BERZELIUS' letzten Lebensjahren, die wir als eine Art *katalytische Vermächtnis* anzusehen haben, sind gegenwärtig noch jung und frisch wie am ersten Tag; ja sie werden erst heute in dem Zeitalter einer eifrigen wissenschaftlichen Erforschung der Enzyme, Vitamine, Hormone, Wuchsstoffe, Formbildungs- und Entwicklungsstoffe volles Verständnis und volle Würdigung finden können !" T. L. D.

Windred, G. MICHAEL FARADAY. A brief account of his electrical researches. *Archeion* 17, 48-63, 1935. ISIS

Zabarinskij, P. Le modèle d'une voiture à vapeur du commencement du XIX[e] siècle. *Archives of the history of science and technology* 6, 349-57, 1935 (in Russian with French summary). ISIS

C. — *Natural sciences*

Gwynn, Stephen. MUNGO PARK and the quest of the Niger. 270 p. London, LANE, 1934. ISIS

Reviewed by J. N. L. BAKER, *Geographical journal* 85, 288, 1935.

Lang, W. D. MARY ANNING, of Lyme, collector and vendor of fossils, 1799-1847. *Natural history magazine* 5, 64-81, 1935. ISIS

A woman who gave great practical aid to HENRY THOMAS DE LA BECHE (1796-1855), WILLIAM BUCKLAND (1784-1856) and WILLIAM DANIEL CONYBEARE (1787-1857) in their work on the Lias of Dorset, and in 1824, discovered the first associated remains of Plesiosaurus. Portraits and illustrations. C. W. A.

Maes, Pierre. Un ami de STENDHAL. VICTOR JACQUEMONT (1801-32). Préface de FORTUNAT STROWSKI. xii+642 p., 12 pl. Paris, DESCLÉE DE BROUWER, 1934. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 268, 1935.

Margerie, Emm. de. VICTOR JACQUEMONT dans l'Himalaya. (1830-1831). *Geografiska annaler*, 394-412, 9 fig., 1935. ISIS

Roule, Louis. CUVIER et la science de la nature. L'histoire de la nature vivante d'après l'œuvre des grands naturalistes français, III. 246 p. Paris, FLAMMARION 1933. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 266, 1935.

Studnička, F. K. Die Grundlagen der Zellenlehre von THEODOR SCHWANN. *Anat. Anz.* 78, 246-57, 1934. ISIS

See *Isis* 23, 528.

Tetley, H. Gorilla skulls in the Bristol Museum. *Nature* 136, 642, 1935. ISIS

Skulls upon which RICHARD OWEN's description (1848) was based. G. S.

Wheeler, William Morton; Barbour, Thomas. The Lamarck manuscripts at Harvard. xxxi+202 p., pl. Cambridge, Mass. Harvard University Press, 1933. ISIS

Reviewed by C. A. KOFOID *Isis* 23, 267, 1935.

D. — *Medical sciences*

Bullock, Waller O. Dr. BENJAMIN WINSLOW DUDLEY (1785-1870). *Annals of medical history* 7, 201-13, 1 fig., 1935. ISIS

Gafafer, William M. JOHN FORBES's British and foreign medical review (1836-1847) and its relation to medical statistics. *Human Biology* 6, 637-49, 1934. ISIS

Hermanides, C. H. Het begin der Thalassotherapie in Nederland. *Bijdragen tot de geschiedenis der geneeskunde* 15, 161-67, 1935. ISIS

Lemay, P. MAINE DE BIRAN et la société médicale de Bergerac. *Bull. de la soc. franç. d'hist. de la méd.* 29, 77-91, 1935. ISIS

Shafer, Henry Burnell. Early medical magazines in America. *Annals of medical history* 7, 480-91, 1935. ISIS

Thomas, J. J. DANIEL DRAKE as a medical teacher. *Medical life* 42, 421-40, 1935. ISIS

Waite, Frederick C. Birth of the first independent proprietary medical school in New England, at Castleton, Vermont, in 1818. *Annals of medical history* 7, 242-52, 1935. ISIS

E. — *Alia*

Crowther, J. G. British scientists of the nineteenth century xii+332 p., 12 pl. London, KEGAN PAUL, 1935. ISIS

Popular biographies of DAVY, FARADAY, JOULE, WM. THOMSON, and MAXWELL. G. S.

Julin, Armand, Centenaire de la " Physique sociale " de QUETELET. *Acad. de Belgique, bull. de la cl. des lettres* 21, 70-80, 1935. ISIS

Milne, H. J. M. Comtist documents. *British Museum quarterly* 9, 123-24, 1935. ISIS

Apropos of Comtist documents recently presented to B. M. by Miss EMILY GEDDES, including the original *Register of Sacraments* of the Positivist group in London and a budget of letters. G. S.

Pessoa, Alberto. J. J. DA GAMA MACHADO, O homem e a obra — o legado à Universidade de Coimbra. viii+163 p., 10 pl. Coimbra, Imprensa da Universidade, 1926. ISIS

Elaborate biography of JOSÉ JOAQUIM DA GAMA MACHADO, an eccentric Portuguese scientist who died in France in 1861 at the age of 86. (see *Isis* 24, 521). Discussion of his *Théorie des ressemblances ou essai philosophique sur les moyens de déterminer les dispositions physiques et morales des animaux, d'après les analogies de formes, de robes et de couleurs.* (4 parts, Paris 1831-58). His legacies to the university of Coimbra. G. S

Quetelet, Adolphe (1796-1876). Centenaire de la " Physique sociale." *Revue de l'Institut de sociologie Solvay*, 15, 299-313, 1935. ISIS

Contient les articles suivants : Centenaire, p. 521. ERNEST MAHAIM : Pourquoi commémorer le Centenaire de la " Physique sociale "?, 523-25. BOVESSE, Discours sur QUETELET, 527-29. ARMAND JULIN, Hommage à ADOLPHE QUETELET, statisticien (1796-1876), 521-68. EUGÈNE DUPRÉEL, QUETELET et la philosophie, 569-75. FRANK H. HANKINS, QUETELET's average man in modern scientific research, 577-86. NIKO GUNZBURG, ADOLPHE QUETELET et la criminologie, 587-97. G.-L. DUPRAT, Contribution à la Journée QUETELET. Sociologie de QUETELET. J. P.

Sarton, George. Preface to Volume XXIII of Isis (QUETELET) *Isis* 23, 6-24, 2 pl., 11 fig., 1935. ISIS

Apropos of the centenary of QUETELET's *Sur l'homme* (Paris 1835). In defense of the statistical approach to sociology. G. S.

XIXth Century (second half)

A. — *Mathematics*

Forsyth, Andrew Russell. Old tripos days at Cambridge. *Mathematical gazette* 19, 162-79, 1935. ISIS

Mathematical personalities at Cambridge, England, in 1878 to 1882, and an account of the teaching system then in vogue. C. W. A.

B. — *Physical sciences and technology*

Boccardi, Jean. La commémoration de JEAN SCHIAPARELLI. *Revue générale des sciences* 46, 379-82, 1935. ISIS

Čelincev, W. Die organische Chemie im Anfang der sechziger Jahre des XIX. Jahrhunderts (nach der " Organischen Chemie " von D. I. MENDELEEV). *Archives of the history of science and technology*, vol. 5. 101-54, Leningrad (in Russian, with German summary). ISIS

Debye, Peter. RÖNTGEN und seine Entdeckung. 21 p., 5 fig. (*Dtsch. Museum, Abh. u. Ber. Jg.* 6). Berlin, VDI-Verlag, 1934. ISIS

Gray, Robert C. The Rev. JOHN KERR, F. R. S., inventor of the Kerr cell. *Nature* 136, 245-47, 3 fig., 1935. ISIS

Harig, G. JAMES CLERK MAXWELL (Versuch einer wissenschaftlichen Biographie). *Archives of the history of science and technology* 6, 33-61, 1935 (in Russian with German summary). ISIS

Kniasev, G. A. D. I. MENDELEEV and the Academy of sciences of St. Petersburg (1858-1907). *Archives of the history of science and technology* 6, 299-331, 1935 (in Russian with English summary). ISIS

Lodge, Sir Oliver. A bibliography of Sir OLIVER LODGE, F. R. S. Compiled by THEODORE BESTERMAN. With a foreword by Sir OLIVER LODGE. xiv+219 p. port. Oxford, University Press, 1935 ($ 7). ISIS

" This bibliography celebrates the sixtieth anniversary of the publication of Sir OLIVER LODGE's first work (apart from a few anonymous and unrecorded juvenilia). In it are set out : (1) all books, pamphlets, and separate

publications generally, their titles being shown in capitals; (2) all distinct editions of such publications, mere reprints (whatever their publishers chose to call them) being recorded (e. g. no. dcxlv) but not entered separately; (3) all contributions to periodical or collective publications of whatever kind, their titles being shown in single inverted commas. Where any paper or article appears in more than one publication, the earliest appearance forms the main entry, the later appearances being notes below (e. g. no. xxviii); (4) letters to scientific and technical journals and to *The times*. A very few letters, of special importance, to other newspapers have also been included; (5) a very few verbatim press reports of public addresses not otherwise published; (6) translations into foreign languages. In the second part are set out all the books published about Sir OLIVER LODGE or his writings, together with a few more fugitive publications of the same kind. Magazine and newspaper articles about Sir OLIVER LODGE are so extremely numerous and so widely distributed that I have not attempted to give more than a representative selection."

In this preface Sir OLIVER recalls his lecture on Ether waves at Oxford in 1894 "where the subject that has grown into wireless telegraphy was first called attention to, but not reported on. Had it not been that the Editor of *The Electrician* (who at that time was exceptionally competent) was present and made some reference to it, it might have escaped notice : though he was deceived by the title and some of the circumstances, and did not perceive or anticipate the large outcome and great development which has now taken place." G. S.

Matschoss, Conrad. GOTTLIEB DAIMLER in der Geschichte des Kraftwagens zur 100. Wiederkehr seines Geburtstages am 17 März 1934. 28 p., figs. *Deutsches Museum, Abhandlungen und Berichte* 6, 1934. ISIS

Partington, J. R. ADOLF VON BAEYER, 1835-1917. *Nature* 136, 669-70, 1935. ISIS

Zabarinskij, P. P. Sur l'histoire de l'invention du char de combat. *Archives of the history of science and technology* vol. 5, 473-89, Leningrad, 1935 (in Russian with French summary). ISIS

" L'article présente la description d'une voiture à chenilles, proposée par l'inventeur français E. BOUIJ sous le nom ' la voiture roulant sur des rails mobiles tournants '. L'invention se rapporte à l'époque des 70-èmes années du siècle écoulé; elle est décrite dans un manuscrit lithographié, publié à Marseille en 1874." " On y trouve pour la première fois l'idée technique du tank moderne et des projets qui frappent par leur profondeur de prévoyance et l'appréhension non seulement de toute une série de questions générales, mais des problèmes techniques spéciaux, qui n'ont pas été résolus jusqu'à présent par les meilleurs constructeurs de nos jours."

C. — *Natural sciences*

Barlow, Nora. CHARLES DARWIN and the Galapagos Islands. *Nature* 136, 391, 1935. See also *Nature* 136, 534-35. ISIS

Bertrand, Louis. EMILE MAUPAS (1842-1916). *Isis* 23, 256, 1935. ISIS

Hingston, Richard Williams G. DARWIN. 144 p. London, DUCKWORTH, 1934. ISIS

Reviewed by M. A. C. HINTON, *Natural history magazine* 5, 42, 1935.

Pergameni, Charles. ADRIEN DE GERLACHE, pionnier maritime (1866-1934). Préface de J. B. CHARCOT, 205 p. Bruxelles, (s. d.). ISIS

Rattray, Robert Fleming. SAMUEL BUTLER : a chronicle and an introduction. 216 p. London, DUCKWORTH, 1935 (5s). ISIS

This life of BUTLER devotes considerable attention to his view on evolution, as revealed in *Life and habit*, *Evolution old and new*, *Unconscious memory*, and *Luck or cunning?* There are citations of BUTLER's little known early contributions on evolution, including correspondence in *The press*, Canterbury, New Zealand, 1862 with articles entitled *Darwin on the origin of species*, *A dialogue*, a reply to a rejoinder entitled *Barrel-organs*, and *Darwin among the machines*. BUTLER's controversy with DARWIN over the additions in the English edition to the *Life of Erasmus Darwin* by KRAUSE which seemed to him to have been inspired by his *Evolution old and new*, but without recognition of the source, is again reviewed with a sympathetic attention to BUTLER's feeling over the incident. The origin and growth of BUTLER's concept of *Unconscious memory* as an evolutionary factor is traced through his published writings and his diary. C. A. K.

Schneider, Guido. K. E. v. BAER gegen DARWIN. *Arch. Gesch. d. Med. u. d. Naturw.* 27, 494-98, 1935. ISIS

Tricot-Royer, Dr. PAUL HÉGER (1846-1925) et l'histoire de la médecine. *Scalpel* 8 p., pl., le 6 mars 1926. ISIS

D. — *Medical sciences*

Baumgartner, Leona. EDWIN KLEBS. *New England Journal of medicine* 213, 60-63, port., 1935. ISIS

Reviewed in *Nature* 136, 675, 1935.

Brown, Lawrason. ROBERT KOCH (1843-1910). An American tribute. Parts II-III, *Annals of medical history* 7, 292-304, 385-401, 1935. ISIS

Hall, Courtney Robert. Confederate medicine. Caring for the Confederate soldier. An introduction to the history of the medical

corps of the Confederate army in the war between the states. *Medical life* 42, 445-508, 1935. ISIS

Leake, Chauncey D. Discovery of the anesthetic properties of cocaine (1884). *Isis* 23, 253-56, 1935. ISIS

Monteiro, Hernâni. O professor JOÃO PEREIRA DIAS LEBRE (1829-1900) subsídios para a história do ensino da anatomia na escola do Pôrto. *Arquivo de anatomia e antropologia* 16, 209-32, 255-76, 1934 (to be con'd). ISIS

Olmsted, J. M. D. CLAUDE BERNARD as a dramatist. *Annals of medical history* 7, 253-60, 1935. ISIS

Sigerist, Henry E. The correspondence of MAX VON PETTENKOFER (1818-1901). *Bulletin of the institute of the history of medicine* 3, 607-09, 1935. ISIS

Sigerist, Henry E. Surgery at the time of the introduction of antisepsis. *Journal of the Missouri State Medical Association*, 169-76, 1935. ISIS

XXth Century

A. — *Mathematics*

Weyl, Hermann. EMMY NOETHER. *Scripta mathematica* 3, 201-20, 1 port., 1935. ISIS

B. — *Physical sciences and technology*

(Ducloux, E. H.) Dr. ENRIQUE HERRERO DUCLOUX. *Revista de la Facultad de ciencias químicas*, Universidad Nacional de la Plata (Argentina), 8, 1-68, 1933. ISIS

This entire issue was published to honor Prof. DUCLOUX at the time of his retirement from the directorship of the Institute of chemical investigations. It contains a portrait, numerous extracts from his public addresses and his scientific and literary works, and an extensive bibliography of his contributions to the history of chemistry, mineralogical, analytical, food, and agricultural chemistry, water analysis, chemical education, and chemical warfare. M. E. W.

Fink, Colin G. Electrochemistry's debt to EDGAR FAHS SMITH. Cathode film control in electrometal deposition. *Science* 82, 1-5, 1935. ISIS

Hale, George E. The astrophysical observatory of the California Institute of technology. *Astrophysical journal* 82, 111-39, 11 pl., 1935. ISIS

Lippmann, Edmund O. von. Fortschritte der Rübenzucker-Fabrikation 1934. *Chemiker-Zeitung* Nr. 14, 148-50, 1935. ISIS

C. — *Natural sciences*

Gabel-Jørgensen. Dr. KNUD RASMUSSEN's contribution to the exploration of the south-east coast of Greenland, 1931-1933. *Geographical journal* 86, 32-53, 1935. ISIS

Portrait of RASMUSSEN, and some biographical material. C. W. A.

Junk, Wilhelm. Das Werden einer grossen Encyclopaedie. Eine Jubilaeums-Schrift. 21 p., port. 's Gravenhage, JUNK, 1935 (Holl. fl. 0.80). ISIS

To celebrate the 25th anniversary of the beginning of the *Coleopterorum catalogus*. Auxilio et auspiciis W. JUNK editus a S. SCHENKLING, together with a list of the 141 parts published from 1910 to 1934 (price : M. 2187) and portrait of SIGMUND SCHENKLING. G. S.

Mackinder, Sir Halford. Progress of geography in the field and in the study during the reign of His Majesty King GEORGE the Fifth. *Geographical journal* 86, 1-12, 1935. ISIS

An exceptionally penetrating analysis of the function and position of geography in relation to other sciences and arts. More important than the title suggests. C. W. A.

Newbigin, Marion I. Obituary by E. G. R. TAYLOR, *Geographical journal* 84, 367, 1934. ISIS

Editor of the *Scottish geographical magazine* 1902-1934. C. W. A.

Raunkiaer, C. The life forms of plants and statistical geography : being the collected papers of C. RAUNKIAER. xvi+632 p. Oxford, Clarendon Press, 1934. ISIS

Reviewed by C. D., *Geographical journal* 84, 455, 1934. The papers, ranging from 1903 to 1928, are arranged in chronological order, and translated into English. C. W. A.

(Wallén, A. W.). Obituary notice of AXEL WILHELM WALLÉN, PH. D. *Geographical journal* 85, 488, 1935. ISIS

Swedish meteorologist and hydrologist : born Goteborg 1877, died 1935, 2, 24. C. W. A.

D. — *Medical sciences*

Cadarso, Alexandre Rodriguez (1887-1933). Obituary by HENRIQUE DE VILHENA. *Arquivo de anatomia e antropologia* 16, 501-25, port., 1934. ISIS

Goodwin, George Munro. RUSSELL A. HIBBS, pioneer in orthopedic surgery, 1869-1932. x+136 p., 1 front., pl. New York, Columbia University Press, 1935 ($ 2.00). ISIS

D'Irsay, Stephen (1894-1934). Obituary by HENRY E. SIGERIST. *Bull. of the institute of the history of medicine* 3, 431-50, port., 1935. ISIS

Marchoux, M. Notice nécrologique sur CARLOS CHAGAS (1879-1934). *Bull. Acad. méd.* 112, no. 41, 1934. ISIS

St. John, Christopher, (i. e, CHRISTABEL MARSHALL). CHRISTINE MURRELL, M. D. : her life and her work. London, WILLIAMS and NORGATE, 1935. ISIS

Sigerist, Henry E. FRANKLIN PAINE MALL. *Bulletin of the Johns Hopkins Hospital* 56, 139-44, 1935. ISIS

Villela, Eurico. CARLOS CHAGAS (1879-1934). *Mem. inst. Oswaldo Cruz* 29 :1, 1934. ISIS

Born in Oliveira, Minas Geraes, in 1879, CHAGAS graduated in medicine from Rio de Janeiro in 1903, and at once entered the Brazilian public health service. His most important work was the discovery of American trypanosomiasis ("Chagas disease") in 1909. He was made head of the Instituto Oswaldo Cruz in 1917, was director of public health in Rio de Janeiro from 1919-1926, was a permanent member of the Committee of hygiene of the League of Nations, and was appointed director of the Centro internacional de estudos sobre a lepra. CHAGAS was a member of many international medical societies and was the recipient of many honors for his work in public health. C. D. L.

E. — *Alia*

Nesbit, Louis. ARTHUR SCHNITZLER (1862-1931). *Medical life* 42, 511-64, 1935. ISIS

Contents : 1. SCHNITZLER's medical background; 2. The Freudian influence in SCHNITZLER's works; 3. SCHNITZLER and the 'Young Vienna' movement; 4. Der blinde GERONIMO : the compulsion neurosis; 5. Der einsame Weg : Elegy of senescence; 6. CASANOVAS Heimfahrt : the tragedy of senescence; 7. ARTHUR SCHNITZLER : physician-author; 8. ARTHUR SCHNITZLER's works; 9. Bibliography.

PART II

HISTORICAL CLASSIFICATION

I. — ANTIQUITY

1. — ANTIQUITY (*generalities*)

Beck, H. C. Glass before 1500 B. C. *Ancient Egypt and the East*, 7-21, 13 fig., 1934.

" In this paper I am referring to every piece of glass that I know of, that dates to before 1500 B. C. or that has been stated to date to that period, and particulars are given of those that I have personally examined."

Wellmann, Max. Die Stein- und Gemmenbücher der Antike. *Quellen und Studien zur Gesch. d. Naturw. u. d. Med.* 4, 86-149, 1935. ISIS

2. — EGYPT

Adjan, A. Contribution à l'histoire de l'incubateur. *Archives of the history of science and technology* 6, 287-98, 1935 (in Russian with French summary). ISIS

" Une des curiosités de l'Egypte, qui attirait l'attention et provoquait l'admiration des voyageurs de l'Europe aux XVII et XVIII siècles, étaient les fours qui servaient à faire éclore les poussins. Ces fours existaient déjà au début de notre ère, comme nous le prouvent les œuvres de DIODORE de de Sicile et de PLINE. Une description détaillée de ces fours a été faite par les savants qui suivaient l'armée de BONAPARTE en Egypte. La construction, qui servait à l'incubation, présentait une bâtisse carrée en brique recouverte d'une voûte. Chaque four avait deux étages. A l'étage inférieur se trouvaient les œufs, et à l'étage supérieur le combustible — du fumier de chameau et de bœuf en briquettes, mêlé de paille hachée. On faisait ainsi éclore en Egypte plusieurs dizaines de millions d'œufs par an."

Ashley-Montagu, Montague Francis. Restoration of an Egyptian mummified foot. *American journal of physical anthropology* 20, 95-101, 2 pl., 1935. ISIS

Bell, C. D. Jarrett. The obelisk barge of HATSHEPSUT. A conjectural design based on rules evolved from an analysis of the lines of the XIIth dynasty funeral barge. *Ancient Egypt and the East*, 107-14, 3 fig., 1934. ISIS

Bell, C. D. Jarrett. Ancient Egyptian ship design; based on a critical analysis of the XIIth dynasty barge. *Ancient Egypt and the East*, 101-11, 6 fig., 1933. ISIS

Caton-Thompson, Gertrude ; Gardner, E. W. The desert Fayum. 2 vols., xiv+167 p.; vii+114 pl. London, Royal Anthropological Institute of Great Britain and Ireland, 1934. ISIS

Reviewed by V. GORDON CHILDE, *Nature* 136, 353-54, 1935; by OLIVER H. MYERS, *Antiquity* 9, 251-53, 1935; and by O. H. M., *Ancient Egypt and the East* 63, 1935.

Crowfoot, G. M. The mat weaver from the tomb of Khety. *Ancient Egypt and the East*, 93-99, 7 fig., 1933. ISIS

Dawson, Warren R. Studies in the Egyptian medical texts. *Journal of Egyptian archaeology* 18, 150-54, 1932 ; 19, 133-37, 1933. ISIS

De Lint, J. G. Massage in het oude Egypte. *Bijdragen tot de geschiedenis der geneeskunde* 15, 168-71, 1935. ISIS

Erman, Adolf ; Grapow, Hermann. Wörterbuch der ägyptischen Sprache, in Auftrage der Deutschen Akademien hrsg. Die belegstellen. 1. Heft nebst Verzeichnis der Abkürzungen. (*Des Wörterbuchs* 11. Lfg., Bd. 6, 1). 96+12 p. Leipzig, HINRICHS, 1935. ISIS

Reviewed by A. SCHARFF, *OLZ* 38, 424, 1935.

Guest, E. M. Pathology and art at el Amarna. *Ancient Egypt and the East*, 81-88, 11 fig., 1933. ISIS

Guiart, Jules ; Reuter, Louis. Al-ṭibb wal-taḥnīṭ fī 'ahd al-farā' ina (Medicine and embalming in the time of the Pharaohs) translated into Arabic by ANṬŪN ZAKRY. 208 p., many illustr. Maṭba' at al-sa' ada, Cairo 1926. ISIS

Homburger, Mlle. Les noms égyptiens des parties du corps dans les langues négro-africaines. *Académie des inscriptions*, Comptes rendus, 371-75, 1928. ISIS

Lane, Margharita. The pull-saw in Egypt. *Ancient Egypt and the East*, 55-58, 4 fig., 1935. ISIS

Leigh, Rufus Wood. Notes on the somatology and pathology of ancient

Egypt. *University of California publications in American archaeology and ethnology* 34, 1-54, 7 pl., 1934. ISIS

" This study is based on an examination of the Egyptian skeletal collection in the Museum of Anthropology, University of California. Opportunity for observing this valued group was afforded by A. L. KROEBER, director of the museum. The collection was made by the Hearst-University of California Expedition (1899-1905) directed by G. A. REISNER. The collection is the largest and probably the most representative, geographically and chronologically, of any in America."

Lucas, Alfred. Ancient Egyptian materials and industries. Second edition, revised and greatly enlarged. xii+447 p. London, ARNOLD, 1934. ISIS

Reviewed by STANLEY CASSON, *Antiquity* 9, 237-39, 1935; and by C. N. B., *Geographical journal* 86, 75, 1935.

Lucas, Alfred. Artificial eyes in ancient Egypt. *Ancient Egypt and the East*, 84-98, 2 fig., 1934. ISIS

Lucas, Alfred. The occurence of natron in ancient Egypt. *Journal of Egyptian archaeology* 18, 62-66, 1932. ISIS

Lucas, Alfred. The use of natron in mummification. *Journal of Egyptian archaeology* 18, 125-40, 1932. ISIS

Mačinskij, A. Two notes on ancient Egyptian agricultural technique. *Archives of the history of science and technology* 6, 279-85, 10 fig., 1935 (in Russian with English summary). ISIS

" 1. On an ancient wall-painting (the tomb of NAKHT, 15th century B. C.) there is represented a kind of hoe, which has hitherto passed unnoticed by Egyptologists. This hoe has an adze-like appearance; the end of the working-part of the instrument has a metallic plate (blade). The work carried out with this kind of hoe is represented in the picture as preceded by the clearing away of trees, thus showing us the process of tilling virgin soil, covered with grass. Apparently, this process gave rise to this form of hoe with a sharp and strong working-part. 2. The fact is not yet established, since when ancient Egyptians began to cultivate uninundated lands. The process of agricultural labour in low lying fields is clear; the ancient Egyptian plough seems adapted for this purpose. But some representations (like that described in 1) permit us to think that, at any rate, from the time of XVIII dyn., some of the higher lands (lying above the flood level) were under cultivation. Whether that had been caused by the growth of population or by the growth of private landownership, or again, by the necessity of grain-export, or some other social and economic reason, is not yet clear."

Partington, J. R. Chemistry in the Bucheum. *Journal of the Society of Chemical Industry* 54, 884-86, 1935. ISIS

"The excavations in the Bucheum, in Egypt, carried out under the supervision and with the active participation of Sir ROBERT MOND, have yielded results of considerable interest in the early history of materials, the value of the information being considerably enhanced by the great care which has been taken to have the objects examined by experts in chemistry and metallurgy. Since these results supplement the information given in my recent book, a short summary of those which are of chemical interest is now given."

Petrie, Flinders. Egyptian shipping. Outlines and notes. *Ancient Egypt and the East*, 1-14, 65-75, figs., 1933. ISIS

Pirenne, Jacques. Histoire des institutions et du droit privé de l'ancienne Egypte. Tome I : Des origines à la fin de la IVe dynastie; t. II : La Ve dynastie. 400 p.; 570 p. Bruxelles, Editions de la fondation-égyptologique Reine ELISABETH, 1932-1934.

Reviewed by A. MORET, *Journal des savants*, 97-106, 1935.

Porter, Bertha ; Moss, Rosalind L. B. Topographical bibliography of ancient Egyptian hieroglyphic texts, reliefs, and paintings. III. Memphis (Abū Rawāsh to Dahshūr) IV. Lower and middle Egypt (Delta and Cairo to Asyūt). xxi+254 p., xxvii+294 p., fig. Oxford, Clarendon Press, 1931-34. ISIS

Reviewed by LUDWIG BORCHARDT, *OLZ* 38, 606-07, 1935; by M. A. M., *Ancient Egypt and the East* 61, 1935.

Sandford, K. S. ; Arkell, W. J. Prehistoric survey of Egypt and Western Asia. Vol. II : Palaeolithic man and the Nile Valley in Nubia and Upper Egypt. Vol. III : Palaeolithic man and the Nile Valley in Upper and Middle Egypt. (Oriental Institute Publication, University of Chicago). Chicago, 1934. ISIS

Reviewed by D. M., *Ancient Egypt and the East*, 65, 1935; by W. B. WRIGHT, *Antiquity* 9, 361-63, 1935; by JOHANNES WALTHER, *OLZ* 38, 421-24, 1935.

Šolpo, N. Weberei in Altägypten. *Archives of the history of science and technology*, vol. 5, 251-71, Leningrad, 1935 (in Russian, with German summary). ISIS

Spielmann, Percy E. To what extent did the ancient Egyptians employ bitumen for embalming? *Journal of Egyptian archaeology* 18, 177-80, 1932. ISIS

Stegemann, Viktor. Über astronomisches in den koptischen Zaubertexten. *Orientalia* 4, 391-410, 1935. ISIS

" Man sieht es ist nicht viel, was die koptischen Magier an Astronomica in ihren Texten bringen und dass das Wenige grösstenteils 'Interpretation' speziell biblischer Anschauungen darstellt. Doch sind einige ausserbiblische Anregungen (Isishymnus Gnosis) vorhanden. Dass sich alles Behandelte nur in Texten des 5. 8. Jahrhunderts findet, sei nochmals betont."

Till, Walter. Zu den Wiener koptischen Zaubertexten. *Orientalia* 4, 195-221, 1935. ISIS

Wainright, G. A. Iron in Egypt. *Journal of Egyptian archæology* 18, 3-15, 2 pl., 1932. ISIS

" Iron in Egypt as in many other countries was obtained from meteorites long before the Iron Age set in."

Wheeler, Noel F. Pyramids and their purpose. III. Pyramid mysticism and mystification. *Antiquity* 9, 292-304, 1935. ISIS

Worrell, W. H. Coptic magical and medical texts. *Orientalia* 4, 1-37, 184-94, 1935. ISIS

" Among the papyri acquired for the University of Michigan by the late Prof. FRANCIS W. KELSEY in the years 1921-27 are thirty-three items which have to do with Coptic magic or medicine. The writing material in a few cases is not actually papyrus but vellum or paper."... " The texts here presented are Inv. 593 α, 593 β, 1190, 1523, 3565, 4932 f and Ms. 136, in another order, based roughly upon age and importance. Provenance is most cases is unknown. Inv. 1190 was said by the dealer to have come from Araba al-Madfuna (Abydos), and the statement may be credited perhaps, because it is unusual. Ms. 136 was bought by Dr. DAVID ASKREN in Medinat al-Fayyum, and doubtless came from the immediate neighbourhood."

3. — BABYLONIA AND ASSYRIA

Forbes, R. J. Untersuchungen über die ältesten Anwendungen von Bitumen in Mesopotamien. *Bitumen* 16 p., 15 fig., Berlin, 1935. ISIS

Gadd, Cyril John. The Assyrian sculptures. iii+79p., 18 fig. London British Museum, 1934. ISIS

Gadd, Cyril John. Seals of ancient Indian style found at Ur. *Proceedings of the British Academy* 18, 191-210, 2 pl., 1932. ISIS

Gandz, Solomon. Artificial fertilization of date-palms in Palestine and Arabia. *Isis* 23, 244-50, 1935. ISIS

Jean, Charles F. Vocabulaire du Louvre AO 6447. *Revue d'assyriologie et d'archéologie orientale* 32, 161-75, 1935. ISIS

Le vocabulaire est divisé comme suit : 1. champs, 2. localités, 3. cours d'eau, 4. étoiles, 5. miel, 6. huiles, 7. sésame, 8. giš, 9. orges, 10. pailles, 11. figues, 12. kurun, 13. dattes mûres, 14. dattes vertes, 15. lin. G. S.

Langdon, S. The Sumerian word for " year " and origin of the custom of dating by events. *Revue d'assyriologie* 32, 131-49, 1935. ISIS

Neugebauer, O. Der Verhältnisbegriff in der babylonischen Mathematik. p. 235-58 (*Analecta orientalia commentationes scientificae de rebus orientis antiqui cura pontificii instituti Biblici editae*, 12. Miscellanea orientalia dedicata ANTONIO DEIMEL annos LXX complenti). Roma, Pontificio Istituto Biblico, 1935. ISIS

" Es handelt sich im folgenden insgesamt um dreierlei Fragen : erstens soll ein lexikalisches Problem eines mathematischen Textes geklärt werden, zweitens soll an diesem Beispiel die Methode erörtert werden, wie man im Bereich dieser Textgattung zu derartigen Feststellungen gelangen kann und schliesslich soll wenigstens in knappen Umrissen skizziert werden, welche Konsequenzen für die Geschichte der mathematischen Ideenbildungen sich an ein solches terminologisches Problem knüpfen können. Der Aufbau der Arbeit wird eine etwas andere Gliederung erhalten. Es soll zunächst das allgemeinhistorische Resultat vorausgenommen werden, um zu zeigen, warum es sich lohnt, auch in die scheinbar geringfügigsten Einzelheiten der mathematischen Terminologie einzudringen. Danach soll der Text, der dieser Arbeit zugrundeliegt, systematisch analysiert werden, um daran sowohl die Methode einer solchen Bearbeitung wie die Voraussetzungen, auf denen sie ruht, auseinander zu setzen. Schliesslich werden wir wieder zum mathematischen Inhalt des Textes zurückkehren und seinen gesamten Aufbau schildern."... " So erscheint also die griechische Mathematik immer deutlicher als ein bewusster systematischer Neuaufbau des mathematischen Wissens der Antike auf möglichst allgemeingültiger Grundlage, d.h. als die wirklich wissenschaftliche Ordnung und Begründung eines in seinen Wurzeln sehr viel älteren Materials. Ich zweifle nicht daran, dass dieses ältere Material im Wesentlichen der babylonischen Mathematik zu danken ist. Der Nachweis, den ich im Folgenden führen werde, dass nämlich der Begriff des Verhältnisses zweier Grössen bereits längst vor aller griechischen Mathematik bekannt gewesen ist, bildet gewissermassen das letzte Verbindungsglied zwischen vorgriechischer und griechischer Mathematik. Er zeigt, dass wirklich der gesamte Bereich der elementaren Arithmetik und Algebra rationaler Grössen als gegeben angesehen werden kann und lässt damit mit um so grösserer Deutlichkeit hervortreten, worin die eigentliche griechische Leistung gelegen war."

Sarton, George. Additional note on date culture in ancient Babylonia. *Isis* 23, 251-52, 1935. ISIS

Speiser, E. A. The historical significance of Tepe Gawra. *Annual report of the Smithsonian Institution for the year ending* 1933, 415-27 6 pl., Washington, 1935. ISIS

Thureau-Dangin, F. Terminologie mathématique babylonienne. *Revue d'assyriologie et d'archéologie orientale*, 32, 188, 1935. ISIS

Unger, Eckhard. Ancient Babylonian maps and plans. *Antiquity* 9, 311-22, 7 fig., 1935. ISIS

4. — GREECE

Chabanier, E. Astronomie méditerranéenne et marine grecque. *Revue scientifique* 73, 112-22, 4 fig., 153-59, 4 fig. 1935. ISIS

" Je vais essayer de déterminer l'ensemble des connaissances qui forment le fonds de l'astronomie nautique du monde antique. Je me limiterai à l'astronomie primitive qui a été contemporaine des premières méthodes de détermination des latitudes, non pas que la marine antique les ait employées, mais parce qu'elle a contribué à leur établissement en renseignant à la fois les géographes et les astrologues dont les œuvres sont les seules sources qui nous renseignent avec précision sur ces époques reculées."

Cumont, Franz. Les noms des planètes et l'astrolatrie chez les Grecs. *Antiquité classique* 4, 5-43, Bruxelles, 1935. ISIS

" Si nous désirons consacrer ici quelques pages aux noms que les Grecs ont successivement donnés aux planètes, ce n'est point qu'un souci de lexicographe nous engage à en préciser l'emploi et la signification. Mais la vie de ces mots est liée à l'histoire de l'astronomie qui les a créés et de la religion qui les a adoptés. Leur usage peut en outre aider à fixer la date approximative d'écrits dont la chronologie est incertaine. Sans doute ne sera-t-il donc pas inutile d'exposer ici brièvement ce que nous savons de cette onomastique planétaire et ce qu'elle nous apprend, car les lexiques et les manuels les plus répandus expriment souvent à ce sujet des idées erronées, que j'ai longtemps partagées moi-même."

Diller, Aubrey. Geographical latitudes in ERATOSTHENES, HIPPARCHUS and POSIDONIUS (I-1 B. C.). *Klio, Beiträge zur alten Geschichte* 27, 258-69, 1934. ISIS

" Geographical parallels are intended to facilitate the co-ordination of individual observations of latitude at various distant places. They can perform this function best when they express latitude in the same terms in which it is observed. When ERATOSTHENES drew up his system of seven *klimata* expressing latitude by the length of the longest day, he probably thought it would be commonly observed in this form. In the event, however, the measurement of the angle of the sun's rays by means of the

gnomon proved to be the most convenient method of observing latitude. ERATOSTHENES himself, as well as PYTHEAS and others before him, took observations in this way; and HIPPARCHUS used similar angular measurements almost exclusively. These observations could be coordinated best by parallels for degrees, such as we find on modern maps. The parallels for hours, therefore, never served the purpose for which they were intended. Their original institution was somewhat of a mistake, and their prolonged retention a mere yielding to precedent. The system as it finally appears in PTOLEMY's maps is entirely vestigial, containing both the seven half-hour *klimata* of ERATOSTHENES and the quarter-hour parallels of HIPPARCHUS. The margins of the maps, moreover, are graduated in degrees of latitude and longitude, and the maps themselves are divided into squares by meridians and parallels; but while the meridians represent longitude in degrees, the parallels represent latitude in length of day regardless of the graduation in the margins. It was not until the Renaissance that this inconsistency was removed."

D'Irsay, Stephen. The cult of ASKLEPIOS. *Bull. of the institute of the history of medicine* 3, 451-82, 23 fig., 1935. ISIS

Luria, S. Die Infinitesimaltheorie der antiken Atomisten. 199 p. (Abhandlungen des Instituts für Gesch. d. Wissenschaft u. d. Technik, Reihe II, H. 5). Verlag der Akademie der Wissenschaften der USSR, 1935 (in Russian). ISIS

Milne, Herbert John M. Greek shorthand manuals, syllabary and commentary. Edited from papyri and waxed tablets in the British Museum and from the Antinoë papyri in the possession of the Egypt Exploration Society. 9 pl. (Egypt exploration society). London, KEGAN PAUL, 1934. ISIS

Reviewed by MARCEL HOMBERT, *Chronique d'Egypte* 10, 387-88, 1935.

Oliver, John Rathbone. Greek medicine and its relation to Greek civilization. *Bulletin of the institute of the history of medicine* 3, 623-38, 1935. ISIS

Pfister, R. Teinture et alchimie dans l'Orient hellénistique. 59 p. (Seminarium Kondakovianum, *Recueil d'études archéologie, histoire de l'art* 7,) Praha, Institut Kondakov, 1935. ISIS

Elaborate study of the theory and pratice of Greek chemistry, based upon the texts and upon the textiles recently found in Palmyra. See the author's other study on those textiles (Paris 1934) analyzed in the section 11 (2). It includes a very valuable table of the characteristics of natural dyes. The author concludes : " Les recueils de Leyde et de Stockholm sont, pour une petite partie seulement, le reflet des connaissances techniques accumulées depuis des siècles. En les comparant avec les résultats de l'analyse tinctoriale

des textiles anciens, nous voyons que la teinture de la laine est bien à la base de ces travaux mais que ceux-ci, sans doute par suite de l'isolement que se sont imposé les expérimentateurs, se sont développés dans une direction qui n'avait plus aucun rapport avec l'industrie; c'est ainsi que la 'teinture des pierres' qu'ils ont imaginée n'a rien de commun avec la vieille industrie égyptienne des verres et émaux de couleur.

D'après tout ce que nous voyons, ces papyrus qui nous renseignent sur les premières recherches des alchimistes relatent des travaux de laboratoire; ils étaient destinés à un groupe formé de chercheurs, qui, visant la modification des formes de la matière, travaillaient sans aucune préoccupation pratique et très probablement sans aucune idée de lucre et de basse tromperie." G. S.

Preisendanz, Karl. Dans le monde de la magie grecque. *Chronique d'Egypte* 10, 335-42, 1935. ISIS

Conférence faite à la Fondation égyptologique Reine ELISABETH, le 25 janvier 1935.

Schuhl, Pierre-Maxime. Essai sur la formation de la pensée grecque. viii+466 p. Paris, ALCAN, 1934. ISIS

Reviewed by JAMES T. ALLEN, *Isis* 23, 469, 1935.

Wellmann, M. Beiträge zur Geschichte der Medizin im Altertum. *Hermes* 65, 322-31, 1930. ISIS

5. — ROME

Davies, Oliver. Roman mines in Europe. xii+291 p., 49 illus., 6 maps. Oxford, Clarendon Press, 1935 (30 s.). ISIS

"It may appear from its title that this book is incomplete, and that it would have been better to put forward an account of Roman mining not limited to Europe. But my material is of necessity largely derived from personal observation and hearsay during several visits to the Balkans and to Spain, while I have seldom travelled in Asia and never in Africa. The scarcity of printed sources has caused some further lack of proportion. Where I have used new information my descriptions are fuller than where I was drawing on published accounts. The ancient mineral wealth of the Balkans hardly deserves three chapters as against one for Gaul; but many of the Roman mines in Gaul were reopened so long ago that only scanty records of discoveries have been preserved. The evidence for ancient mines is in all cases poor, and archaeologists must not demand so strict a standard as in other branches. Very few old workings have been examined by trained scholars; it would hardly be an exaggeration to say that only in Austria has exploration been carried out on fully scientific standards, as the result of the enthusiasm of Dr. MUCH in the last century and Drs. PITTIONI and SCHMID to-day." After a general conspectus (introductory, legal position;

economic aspects; organization, labourers; mining technique; metallurgical technique), the subject is divided according to the ancient Roman provinces. Maps and indices. G. S.

Gelzer, Matthias. Der Anfang römischer Geschichtschreibung. *Hermes* 69, 46-55, 1934. ISIS

Rome, International map of the Roman Empire. Sheets: Edinburgh (NN 30), Lyon (NL 31), Alexandria (NH 35) Cairo (NH 36), and Aswan (NG 36); scale 1 : 1,000,000,1 inch = 15.78 Roman miles and 16.26 English miles. 1 cm. = 6.4 Roman miles, 6.21 English miles and 10 kilometres. London, Ordnance Survey, 1935. ISIS

Rose, Albert C. Via Appia in the days when all roads led to Rome. *Annual report of the Smithsonian Institution* 347-70, 4 pl., 1934. ISIS

Tricot-Royer, Dr. La tabula Lusoria de Timgad. 4 p. Anvers, De Vlijt, 1921. ISIS

Van Deman, Esther Boise. The building of the Roman aqueducts. xi+440 p., 60 pl., 49 fig. Carnegie Institution of Washington, publication no. 423, 1934. ISIS

Reviewed by G. S., *Isis* 23, 470, 1935.

II. — MIDDLE AGES

6. — MIDDLE AGES (*generalities*)

Blum, André. Les premières fabriques de papier en Occident. *Académie des inscriptions et belles-lettres*, comptes rendus, 102-12, 1932. ISIS

Coomaraswamy, Ananda K. Mediaeval aesthetic. I. Dionysius the pseudo-Aeropagite, and Ulrich Engelberti of Strassburg. *Art bulletin* 17, 31-47, 1935. ISIS

Guitard, E. H. Les eaux minérales en Occident dans le haut moyen âge (du V^e^ au XIII^e^ siècle). *Thalès* 1, 65-70, 1935. ISIS

Janssens, Herman F. Deux textes syriaques inédits relatifs au Phénix. *Muséon* 47, 61-71, 1934. ISIS

Loth, Joseph. L'étude et l'enseignement du droit dans le pays de Galles du X^e au XIII^e siècle. *Académie des inscriptions*, comptes rendus, 135-38, 1931. ISIS

Millàs i Vallicrosa, J. Manuscrits catalans de caràcter astronòmic a la Bibliotheca nacional de Madrid. 11 p. (Analecta sacra tarraconensia 11, fasc. 1-2, Miscellania finke d'historia i cultura catalana, extracte.) Barcelona, Biblioteca Balmes, 1935. ISIS

Analysis of two Catalan astronomical MSS of Madrid. The first, MS 17961 (XIV-XV) : Tractatus variorum de rebus mathematicis. Includes texts of PETER of Dacia, ALCABITIUS, MĀSHĀLLĀH, SACROBOSCO, JACOB BEN MAḤIR IBN TIBBON. The second MS 4238 (XV) : Tabul. alfonsine. The analysis is followed by the Latin text (taken from the first MS) of a perpetual almanach, translated from the Arabic, made at Tortosa for the year 1306.
G. S.

Pouzyna, I. V. La Chine, l'Italie et les débuts de la Renaissance (XIII^e-XIV^e siècles). 102 p., 16 pl. Paris, Editions d'art et d'histoire, 1935. ISIS

L'auteur de ce beau livre, professeur à l'Institut catholique de Paris, y développe une thèse qui fut suggérée pour la première fois par BERNARD BERENSON à propos de SASSETTA (*Burlington Mag.*, vol. 3, 1903) : l'art siennois fut-il influencé par l'art chinois? Il nous dit (p. 75) " Lorsque nous comparerons le nouveau dans la peinture du Trecento avec l'usuel dans l'art chinois, nous arriverons à la certitude qu'il n'y a que l'art chinois qui puisse être considéré comme la source principale de la nouvelle expression artistique des trecentistes. Cette source, uniforme dans sa nature, nous expliquera le fait étonnant que l'art du Trecento ait conservé son caractère uniforme malgré de multiples innovations, introduites par les peintres italiens de cette époque." Pour établir cette thèse il faudrait tout au moins prouver l'existence de tableaux chinois en Italie à cette époque, or je ne connais aucun exemple de ce genre. Des broderies et tissus chinois étaient certainement connus en Europe. Le pape BENOIT XI (mort en 1304) fut enseveli dans une étoffe chinoise et le frère GIOVANNI DA MARIGNOLLI rapporta une robe chinoise à la sacristie du couvent franciscain de Florence vers le milieu du XIV^e siècle. Ces tissus ne suffisent pas cependant à expliquer ce qu'il y a de 'chinois' dans les peintures du Trecento. A mon avis les affinités qui nous font penser parfois à la Chine lorsque nous voyons les œuvres des GIOTTO, des DUCCIO et d'autres s'expliquent plus simplement par des conditions psychologiques semblables. La piété et le naturalisme franciscains ont pu agir dans une certaine mesure dans le même sens que le Bouddhisme. D'ailleurs l'auteur se rend bien compte de la fragilité de sa thèse et nous avoue (p. 96) " Évidemment, l'influence chinoise n'a pas été la source unique de l'art italien au début de la Renaissance. Même pour Sienne, la peinture chinoise a été une source importante, mais non pas la source unique. La Renaissance italienne s'inspira d'émotions, de motifs, d'idées et de modèles fournis par la culture contemporaine de races et de

peuples différents, et aussi par des civilisations depuis longtemps éteintes, afin de les remodeler selon son propre génie créateur." G. S.

Sigerist, Henry E. Sidelights on the practice of medieval surgeons. *Proceedings of the Annual congress on medical education, hospitals and licensure*, 6 p., Chicago, February 18 and 19, 1935. ISIS

Szabolcsi, Benedict. The eastern relations of early Hungarian folk-music (the persistence of an archaic middle-Asian music-style in middle-Europe). *Journal of the royal asiatic society* 483-98, 1935. ISIS

" In the early contact of the Magyars with the Turkish tribes of Middle Asia (fourth-eighth century) we have, perhaps, the sole explanation of the fact that *at the bottom of Hungarian folk-music there still lives an archaic, Middle-Asian melody-style*. As for the other European types of pentatonia, from the tonesystem of archaic Greek music to ancient Celtic and Iberian tunes, they sprang, evidently, from other sources and never blended with such peculiarly 'Eastern' principles of the melody-weaving as the 5-degree system of the Magyars, Tsheremis, Tartars, and Mongolians."

Thompson, Daniel V., jr. Trial index to some unpublished sources for the history of mediaeval craftsmanship. *Speculum* 10, 410-31, 1935. ISIS

Thorndike, Lynn. Magic and science in the fourteenth and fifteenth centuries. *Columbia University Quarterly* 27, 132-40, 1935. ISIS

Thorndike, Lynn. A history of magic and experimental science. Volumes III and IV : fourteenth and fifteenth centuries. xxvi+827 p.; xvii+767 p. (History of science society publications, new series 4). New York, Columbia University Press, 1934. ISIS

Reviewed by G. S., *Isis* 23, 471-75, 1935.

Tricot-Royer, Dr. Les anciens ducs de Brabant. Leur mort, leurs sépultures, les exhumations de Louvain, 32 p., illus. Paris, Editions Aesculape (s. d.). ISIS

Willard, James F. (1876-1935). Progress of medieval studies in the United States of America and Canada. *Bulletin no.* 12. Boulder, Col., Mediaeval Academy of America, 1935. ISIS

Wolfson, Harry Austryn. The internal senses in Latin, Arabic, and Hebrew philosophic texts. *Harvard Theological review* 28, 69-133, 1935. ISIS

Very elaborate study which is too condensed to be summarized. In the end very valuable glossary giving the Arabic, Hebrew and Latin equivalents of Greek terms. G. S.

Zinner, E. Mittelalterliche Sonnengucker. *Das Weltall* 34, 76-78, 3 figs., 1935. ISIS

7. — BYZANTIUM

Choukas, Michael. Black angels of Athos. With a foreword by ROBERT M. MACIVER. London, CONSTABLE, 1934. ISIS

Gerland, Ernst. Das Studium der byzantinischen Geschichte vom Humanismus bis zur Jetztzeit. 61 p. (*Texte und Forschungen zur byzantinisch-neugriechischen Philologie*). Athen, Verlag Chronika, 1934. ISIS

Brief outline of the history of Byzantine studies from the Renaissance to our own days. The price of this pamphlet of 61 pages, cheaply printed in Greece, is 9 RM. which is exorbitant, outrageous, and discouraging. G. S.

III. ORIENTAL SCIENCE AND CIVILIZATION

8. — WESTERN ASIA

Childe, V. Gordon. New light on the most ancient East. The Oriental prelude to European prehistory. xviii+327 p., 32 pl. London, KEGAN PAUL, 1934. ISIS

Reviewed by GEORGE SARTON, *Isis* 23, 269-71, 1935.

Contenau, Georges. La civilisation des Hittites et des Mitanniens. 286 p., 16 pl., 26 fig., 2 maps. Paris, PAYOT, 1934 (24 fr.). ISIS

Eisler, Robert. Das astrologische Bilderbuch Ṣalmê Shakanakkê. *OLZ* 38, 665-67, 1935. ISIS

" Mischgestaltige Dämonen, wie in diesem astrologischen Text beschrieben, sind in Babylon nicht etwa von BEROSSOS erfunden worden. Die Griechen kannten sie schon zur Zeit des EMPEDOKLES. Die untere Zeitgrenze ist durch die Benützung bei PETOSIRIS-NECHEPSO gegeben. Da ich nicht glauben kann, dass die babylonische Astrologie in Ägypten gerade erst unter den dem seleucidischen Einfluss abgeneigten Ptolemäern eingedrungen sein sollte, würde ich das Original — das man sich dann in der aramäischen Reichssprache abgefasst zu denken hätte — in der Zeit der Perserherrschaft über Ägypten entstanden denken. Die Übersetzung dieser und andrer hermetischer Schriften ins Griechische mag wirklich von den Skriptoren der ptolemäischen Staatsbibliothek in Alexandria, oder doch jedenfalls zur Ptolemäerzeit besorgt worden sein."

Hrozný, Bedrich. L'entraînement des chevaux chez les anciens Indo-Européens d'après un texte mîtannien-hittite provenant du 14e siècle av. J.-C. *Archiv orientální* 3, 431-61, 1931. ISIS

Ma note précédente (*Isis* 19, 284) étant trop brève, je crois utile de la compléter par l'analyse suivante extraite du livre récent de G. CONTENAU : *La civilisation des Hittites et des Mitanniens* (p. 89-90, Paris 1934). " Un nommé KIKKULI, de Mitanni, faisant fonction de grand écuyer à la cour de Boghaz-Keui, écrivit un traité sur le dressage des chevaux. Ce traité d'une précision méticuleuse, décrit jour par jour et presque heure par heure les opérations que nécessite le dressage, et celui-ci ne dure guère moins de six mois; cette minutie tranche nettement sur l'imprécision orientale et le traité, de ce point de vue, est absolument unique. Il est d'ailleurs intéressant de voir que les chevaux, comme dans les dressages modernes, sont sélectionnés au moyen d'un galop d'essai; après quoi, on les fait jeûner et suer sous des couvertures pour les débarrasser de leur graisse superflue; ils reçoivent même une boisson laxative pour que l'amaigrissement soit plus vite atteint; pendant le dressage, ils sont promenés au pas, puis entrainés sur des distances de plus en plus longues, soit au galop, soit à l'amble. Et à propos de certains mouvements, KIKKULI emploie des termes d'origine indienne, par exemple *aika vartanna*, dans un tour, puis *tera*, — *panza* —, *satta*, *navartanna*, où l'on a le mot *vartanna* (de *vartanam*, tourner) et l'adjectif indien, trois, cinq, sept, neuf. Une telle analyse amène à la conclusion que dans le Mitanni, en plus des Hurri, il y a un élément indoeuropéen, plus spécialement indien, et qu'il constitue la classe dirigeante." G. S.

Sayce, A. H. Indians in Western Asia in the fifteenth century B. C. *Oriental studies in honour of Cursetji Erachji Pavry*, 399-402, 1933. ISIS

" To sum up : (1) There is no evidence for the belief, now abandoned, that there was an Iranian element in the population of the Near East in the Tel el-Amarna age. (2) There was, however, in both Mesopotamia and Eastern Asia Minor a people who spoke — not a derivative language from Sanskrit — but Sanskrit itself and who occupied themselves with breeding and training the horse. (3) There is no evidence that this people bore the name of 'Kharriyan'; on the contrary instead of 'Kharriyan' the name must be read Murriyan and is, in fact, identical with the native name of Mitanni (Murwu). (4) Arguments derived from the conjectural etymologies of proper names are always dangerous, more especially where the language to which the names belong is unknown. (5) The single support for ascribing an Indian etymology to certain Mitannian and other names breaks down on examination, *arta* being a Mitannian as well as an Indo-European word. While, therefore, it is possible that some of the personages mentioned in the Tel el-Amarna and Hittite texts were Indian and bore Indian names we have no proof at present that such was the case. We must be satisfied with the fact that Sanskrit was spoken in the Near East in the fifteenth century before our era, and that a Proto-Indian people were once included within the limits of the Hittite Empire."

EASTERN ASIA

(Including works relative to the whole of Buddhist Asia, or to India, Central and Eastern Asia combined)

Coedès, G. L'origine du cycle des douze animaux au Cambodge. *T'oung pao* 31, 315-329, 1935. ISIS

Giap, Tran-Van. Le Bouddhisme en Annam. Des origines au XIII^e^ siècle. *Bulletin de l'école française d'Extrême-Orient* 32, 191-268, 1932. ISIS

Gibert, Lucien. Dictionnaire historique et géographique de la Mandchourie. xx+1040 p., maps. Hongkong, Société des Missions-étrangères, 1934. ISIS

Contains very rich amount of information, unfortunately the author has thought necessary to introduce a new system of transcription of Chinese characters, somewhat similar to the French system but different from it. The author is a French Catholic missionary established in Manchuria. G. S.

Haguenauer, M. C. Encore la question des Gores. *Journal asiatique* 226, 67-115, map, 1935. ISIS

Suivi de "Tables chronologiques pour servir à l'histoire des rapports internationaux en Extrême-Orient, du début du XIVe siècle à la fin du XVI^e^." (p. 90-115) avec une carte commerciale de l'Extrême-orient. G. S.

Janse, Olov. L'Empire des steppes et les relations entre l'Europe et l'Extrême-Orient dans l'Antiquité. *Revue des arts asiatiques* 9, 9-26, 9 pl. 4 maps, 1935. ISIS

With many illustrations of the Ordos bronzes. G. S.

Laufer, Berthold (1874-1934). Rye in the Far East and the Asiatic origin of our word series "rye". *T'oung pao* 31, 237-73, 1935. ISIS

Prez, Alfred Steinmann de. Observations sur la flore et la faune représentées sur les bas-reliefs de quelques monuments indo-javanais. *Revue des arts asiatiques* 9, 57-62, 7 pl., 1935. ISIS

Wales, H. G. Quaritch. A newly-explored route of ancient Indian cultural expansion (Introducing some new views on the history of the Śailendra Empire of Indonesia). *Indian Art and Letters* 9, 1-31, 8 pl., 1935. ISIS

9. — INDIA

Belaiew, N. T. The bismar in ancient India. *Ancient Egypt and the East*, 76-80, 4 fig., 1933. ISIS

Coomaraswamy, Ananda K. The intellectual operation in Indian art. *Journal of the Indian society of oriental art* 12 p. 1935. ISIS

" The Oriental art cannot be isolated from life and studied 'in vacuo'; we can only be said to have understood it when we have, at least for the time being, so far identified ourselves with its premises as to fully consent to it, taking its kind for granted in just the same way that we take a modern fashion for granted; until we do this, the forms of Oriental art, will always seem to us arbitrary or at the least exotic or curious, and this will be the measure of of our misunderstanding, for it was none of these things in the eyes of those for whom it was made and who knew how to use it. The man who still worships the Buddhist image in its shrine has in many respects a better understanding of Buddhist art than the man who looks at the same image in a museum as an object of 'fine art'."

Coomaraswamy, Ananda K. The *Rig-veda* as *Land-náma-bók*. viii+39 p., 3 pl. London, LUZAC, 1935 (3/6). ISIS

" In the *Rig-veda*, the Five Aryan kindreds are spoken of as immigrants; they have come from another place across the waters, and have settled and tilled the lands on the hither shore. This process of landtaking has generally been interpreted as referring to an historical immigration of an Aryan speaking people who, fair in colour and sharply distinguished from the dusky pagan Dasyus, crossed the Sarasvatī in the Panjab and made their home in Bharatavarṣa. That is an euhemeristic interpretation of a traditional literature which is strictly speaking devoid of any historical content whatever.."

Coomaraswamy, Ananda K. The transformation of nature in art. 245 p. Cambridge, Harvard University Press, 1934. ISIS

Reviewed by G. S., *Isis* 23, 475-77, 1935.

Eliade, Mircea. Alchimia asiatica. I. Alchimia chineza şi indiana. Editura " Cultura Poporului ". 77 p. Bucharest, 1935. ISIS

The author believes that true Indian alchemy had nothing to do with chemistry and ought not to be called pre-chemistry. A second fascicle, *Alchimia babiloniană* is reported to be in press. T. L. D.

Emeneau, M. B. A union list of printed Indic texts and translations in American libraries. xv+540 p. (*American oriental series*, 7). New Haven, Conn., American Oriental Society, 1935. ISIS

" The list includes all books in Sanskrit, Pali, Prakrit, and Apabhraṁśa, and most of the books in the older stages of the vernaculars (these last are

somewhat incomplete, especially in the case of Urdu texts). Translations of texts are also included. No purely secondary material has been handled. Publications of portions of texts or translations are not included, unless there is some special reason for their inclusion; e. g. fragments of Buddhist Sanskrit texts and of other works otherwise lost are included, as well as important works dealing with large sections of texts. Not only have separately published books been listed, but also journal articles. In general only texts composed before 1800 have been included. Exceptions have been made for later texts of importance, such as law compilations, and also for some quite modern works which form parts of series." This list compiled with great care will be very useful. The *ACLS* deserves to be praised for its generous patronage of it. G. S.

Filliozat, Jean. Le Kumāratantra de RĀVAṆA. *Journal asiatique* 226, 1-66, 1935. ISIS

Petit texte de médecine démoniaque édité en Sanscrit (7 p.), traduit, commenté, et comparé à d'autres documents indiens du même genre. G. S.

Fox Strangways, A. H. The Gāndhāra grāma. *Journal of the Royal Asiatic Society* 689-96, 1935. ISIS

On Hindu musical theory.

Mackay, Ernest. The Indus civilization. viii+210 p., 16 pl. London, DICKSON and THOMPSON, 1935. ISIS

Majumdar, Girija Prasanna. Vanaspati. Plants and plantlife as in Indian treatises and traditions. xii+254+ii p. (Griffith memorial prize essay for 1925). University of Calcutta, 1927. ISIS

The author has taken pains to collect in Sanskrit literature everything pertaining to botany and he publishes it here somewhat in the manner of a a western treatise. He has not always been able to determine the Latin names of the plants named by him. This is indeed a very difficult task. The author is not a Sanskritist by profession but professor of botany at Presidency College, Calcutta. Contents. Introduction. Book 1. Botany and philosophy, Book II. Botany and medicine, Book III Botany and agriculture. Indices. To use the words of Prof. P. C. RAY "This is a valuable monograph in a practically unexplored field." For another important work by the same author see above under XIII-2. G. S.

Müller, Reinhold F. G. Natur-und Medizingeschichtliches aus dem Mahābhārata. *Isis* 23, 25-53, 1935. ISIS

Müller, Reinhold F. G. Über die Zeit der Geschlechtsreife bei den Inderinnen. *Zeitschrift für Rassenphysiologie* 7, 186-91, 1935. ISIS

Müller, Reinhold F. G. Vom *Manas* (Geist) und seinen Krankheiten in der altindischen Medizin. *Janus* 39, 74-93, 1935. ISIS

Rele, Vasant Gangaram. Directional astrology of the Hindus as propounded in Vimshottari Daśā. Part I : Theoretical ; part II : Practical. Second edition. ii+128 p. Bombay, D. B. TARAPOREVALA, 1935 (Rs. 3). ISIS

" The first part of this book was published some years ago as an effort to find out the basis of Vimshottari Daśā which is mostly used by Indian Astrologers for predicting future events. The effort was well received by students of astrology and others interested in the interpretation of the Science. It was suggested by some that its applicability to the horoscope should be worked out in detail mentioning at the same time the principles of predictions, according to the Indian System, so as to save the trouble of hunting after them in the mass of Sanskrit literature on the subject. In due deference to their wishes, I have written the second part of the book taking it for granted that the first principles of Astrology have been mastered by the reader from any Indian or European textbook."

The same author wrote *The mysterious Kundalini* (the physical basis of Yoga), Bombay 1927 (*Isis* 11, 224), 3rd ed., 1931 (*Isis* 19, 426). G. S.

Shirras, G. Findlay. The census of India, 1931. *Geographical review* 25, 434-48, 1935. ISIS

Stcherbatsky, TH. Théorie de la connaissance et de la logique chez les Bouddhistes tardifs, traduit par MASSON-OURSEL et Mme DE MANZIARLY, avec un avant-propos par MASSON-OURSEL. xvi+247p. (*Annales du Musée Guimet, Bibliothèque d'études*, 36). Paris, GEUTHNER, 1926. ISIS

Vogel, J. Ph. (et alii). Annual bibliography of Indian archaeology for the year 1933. Published with the aid of the government of Netherlands India, the Imperial government of India, the governments of H. E. H. the Nizam of Hyderabad, H. H. the Maharaja Gaekwar of Baroda, H. H. the Maharaja of Travancore, H. H. the Maharaja of Cochin, and the government of Ceylon, volume 8. xii+132 p., 9 pl., 5 fig. Leyden, BRILL, 1935. ISIS

With a portrait of HENDRIK KERN (1833-1917) and 9 plates. Excellent bibliography, which has become indispensable to every student of Indian and Indonesian archaeology. G. S.

10. — CHINA

Andersson, Johan Gunnar. Children of the yellow earth. Studies in prehistoric China. xxi+345 p., 32 pl., 147 fig. London, KEGAN PAUL, 1934. ISIS

Reviewed by GEORGE SARTON, *Isis* 23, 271-75, 1935.

Barnes, William H. Chinese influence on Western alchemy. *Nature* 135, 808, 1935. ISIS

" The purpose of this note is to indicate that the apparent completeness of Prof. HOPKIN's picture does not automatically preclude the possibility that reports of Chinese alchemy may have had some influence on the origin of the Egyptian art. Whether such an influence is considered to be 'improbable' or 'probable', present data still appear to indicate that it is 'possible'."

Chavannes, Edouard (1865-1918). Cinq cents contes et apologues Extraits du *Tripitaka chinois*. Analyse sommaire des contes, notes complémentaires, tables et index formant le tome IV de l'ouvrage. (Bibliothèque de l'Institut des Hautes Etudes Chinoises) Paris, LEROUX, 1935. ISIS

EDOUARD CHAVANNES a publié en 1910-11 en trois volumes, la traduction de *Cinq cents contes chinois et apologues*, extraits de *Tripitaka chinois*. Du point de vue de la science générale du folklore ces contes ont un intérêt considérable. Ils nous montrent que c'est le bouddhisme qui nous a conservé les plus anciennes relations écrites de la plupart des récits qui sont le patrimoine commun de l'humanité. Leurs thèmes sont en dehors du temps présent et de l'individu; ils appartiennent à ces pensées sociales qui se sont constituées à travers des siècles innombrables; ils ont donc un intérêt capital pour le philosophe qui cherche en eux les éléments d'une psychologie des peuples fondée sur des réalités. Le quatrième volume contient l'analyse sommaire des *Cinq cents contes* — des notes complémentaires riches en rapprochements entre ces contes et les fables et récits d'autres pays, et enfin un index alphabétique des quatre volumes."

Creel, Herrlee Glessner. Les récents progrès de l'archéologie en Chine. *Revue des arts asiatiques* 9, 96-107, 1935. ISIS

Grumm-Gržimailo, A. Contribution à l'histoire de l'introduction de la vigne en Chine. *Archives of the history of science and technology* vol. 5, 499-506, Leningrad, 1935 (in Russian, with French summary). ISIS

" Il est connu que la vigne cultivée en Chine n'est pas d'origine indigène. Selon l'ancien ouvrage chinois 'Chi-Ki' la première introduction en Chine de la vigne cultivée (*Vitis vinifera* L.) se rapporte à l'époque du voyage en Asie Centrale de l'illustre général chinois TCHANG K'IEN, envoyé en 128 avant J. C. dans les pays occidentaux par l'empereur WOU-TI pour conclure avec l'état de Youé-tchi (qui possédait alors la Bactriane et la Sogdiane) une alliance militaire offensive contre les Huns." " On ne peut admettre, certainement, que toutes les variétés de vigne, cultivées au jourd'hui en Chine, proviennent uniquement des introductions effectuées par TCHANG-K'IEN. Il est hors de doute que les essais d'introduction s'y sont renouvelés, comme l'attestent les annales chinoises." " Cette liste, bien que brève et incomplète permet de se faire une idée sur l'importance primordiale, parmi raisins

cultivés en Chine, des variétés de table et de caisse, provenant incontestablement de l'Asie Centrale. Le groupe des variétés de cuve y fait presque entièrement défaut à la seule exception de la variété 'ma-jou' qui, comme nous l'avons déjà mentionné, a été introduite du Tourfân en 640. Les annales chinoises font dater de cette époque le début de l'œcologie en Chine. Ce n'est qu'en 1715 que les Chinois firent connaissance pour la première fois avec le raisin méditerranéen, lorsqu'on a introduit en Chine les variétés de cuve du sud de la France, avec la participation active des jésuites STAMPF, SUAREZ, BOUVET et PATRENIN."

Hall, Ardelia Ripley. The early significance of Chinese mirrors. *Journal of the American oriental society* 55, 182-89, 1935. ISIS

Hopkins, L. C. The cas-chrom v. the lei-ssŭ. A study of the primitive forms of plough in Scotland and ancient China. *Journal of the Royal Asiatic Society* 707-16, 1 pl., 9 fig., 1935 (to be cont'd). ISIS

Nakayama, T. Acupuncture et médecine chinoise vérifiées au Japon. Traduites du japonais par T. SAKURAZAWA et G. SOULIÉ DE MORANT et précédées d'une préface de G. SOULIÉ DE MORANT, 85 p., 18 ills. Paris, LE FRANÇOIS, 1934 (18 frs.). ISIS

Pelliot, Paul. Un ouvrage sur les premiers temps de Macao. *T'oung pao* 31, 58-94, 1934. ISIS

Apropos of T'ien-tsê Chang Sino-Portuguese trade from 1514 to 1644. A synthesis of Portuguese and Chinese sources. viii+157 p. Leyde, BRILL, 1934.

Rainov, T. Capitalistic expansion and transplantation of science. Front nauki i tekhniki 31-50, 1935 (in Russian). ISIS

The paper deals with China and the impact of European civilization. Parallels from the history of Russia in the XVIIth to XIXth centuries are used as illustrations. A bibliography is appended. A. P.

Salin, Edouard. Figurations animales analogues sur un vase chinois d'époque Tcheou et sur des objets de notre moyen âge. *Revue des arts asiatiques* 9, 108-12, 12 fig., 1935. ISIS

Saussure, Léopold de (1866-1925). La chronologie chinoise et l'avènement des Tcheou. *T'oung pao* 29, 276-386, 1932. ISIS

Continuation posthume de l'article paru dans le même journal 23, 287, 1924. Deuxième partie : 1. La chronologie de Yi-hing; 2. La chronologie de GAUBIL; 3. Examen des indications calendériques du Chou king; 4. Appendice. Astronomie et mythologie dans le Chou king.

Spencer, Joseph Earle. Salt in China. *Geographical review* 25, 353-66, 5 fig., 1935. ISIS

"By force of having four hundred million consumers and of being a semigovernment monopoly salt plays an important part in the domestic, commercial, and political life of China. Salt and iron became government monopolies, more or less, several hundred years before the opening of the Christian era, and salt has ever since provided the central authority, the province, the military feudal lord, the outlaw holder of a transportation route, the local political unit, and, of late years, the national government with a steady source of revenue. It has afforded a living to a host of producers, commission brokers, and distributors while satisfying a fundamental domestic need. In China salt has been listed as one of seven indispensable necessities of everyday human life — fuel, rice, oil, salt, sauce (in which salt is used), vinegar, and tea."

Taam, Cheuk-Woon. The development of Chinese libraries under the Ch'ing dynasty, 1644-1911. A dissertation submitted to the Faculty of the Graduate Library School in candidacy for the degree of Doctor of Philosophy, 1933. ix+107 p. University of Chicago Libraries, 1935 (also published with a Chinese title by the Commercial Press, Shanghai, 1935). ISIS

In the first chapter, the author tries to convey to the reader the Chinese conceptions of a scholar, a book and a library. He then goes on to trace the legacy of the Ming dynasty in the matter of literary treasures and enumerates the different factors leading up to the intellectual development of the Ch'ing period. The second chapter deals with the Imperial Library under various emperors. He particularly praises KANG HSI and CHIEN LUNG for their great effort in building up the imperial collection. The compilation of the *Ssu Ku Chuan Shu* (the four-treasure library) by the latter forms the main theme of discussion though other book treasures in the imperial palaces are duly touched upon. The third chapter outlines the different types of book collectors and gives their general characteristics and common practices. To link up the outstanding collections of the period, the development of the four great libraries after the Taiping Rebellion is fully traced. The fourth chapter explains the great contributions made by the book collectors to scholastic achievement; namely, contribution to methods of study, contribution to the increase of source materials, contribution to bibliographical aids, etc. The last chapter, after a brief account of academy libraries, gives a summary of the general tendency of library development of the entire period stressing its good features as well as weaknesses. The author also discloses three events of significance in the development of Chinese libraries; namely, the discovery of documents and manuscripts by Sir AUREL STEIN, the recovery of ancient Chinese books in Japan by YANG SHOU CHIN and the salvaging of the manuscripts in the library of the Imperial Cabinet by LO CHEN YU. Bibliography of primary and secondary sources, almost exclusively Chinese (p. 101-7). The book having been printed in China, all the Chinese characters are quoted. A very useful work in spite of the lack of an index. G. S.

11. — JAPAN

Okamoto, Noribumi (1847-1931). Wasan tosho mokuroku (Catalogue

of books on Japanese mathematics). 835 p. Tokyo, Imperial Academy of Japan, 1932. ISIS

One of the research projects of the Imperial Academy in 1926 was to organize a committee for the compilation of an extended history of the Japanese mathematics, and appointed Mr. NORIBUMI OKAMOTO, one of the four great living authorities on the subject, to make a preliminary survey. As its first step Mr. OKAMOTO examined over twelve thousand titles on the early Japanese mathematics collected in the Academy's library and grouping them under thirteen classes, he compiled a catalogue. The committee hoped to have a brief historical summary as well as an explanatory note for the students of the Japanese mathematics from Mr. OKAMOTO to append to the volume, but his death in Feb. 1931 made it impossible.

Over five thousand items in the catalogue are in manuscript, for many years in order to make the Academy collection as complete as possible, they had all the known important extant works in both private and public possession copied, and in each case the source is indicated in the note.

SHIO SAKANISHI.

Steinilber-Oberlin, E.; Matsuo, Kuni (and others). Les sectes bouddhiques japonaises, histoire — doctrines philosophiques textes — les sanctuaires. Précédé de deux lettres addressées aux auteurs par MM. Les Bonzes H. UI et H. ONO. xviii+347 p., illus. Paris, CRÈS, 1930. ISIS

Ugata, Tamekichi. Igaku tabaco kô (Notes on tobacco from the medical view point). 314 p., front., illus. Tokyo, RYÛSHÔ-KAKU, 1934 (y. 1.80). ISIS

The author, a physician, has long been interested in the effect of tobacco on its smokers, and in the present volume he deals with the subject historically. Since the 16th century when it was first introduced to Japan through Western traders, the controversy between the pro and anti smokers has not ceased in Japan. The government was not at first kindly disposed to tobacco on account of risk in fire and prohibited its use in 1615. Demoralization of man's body and spirit was the ground of objection by anti-smokers, but others upheld the new pastime on the ground of its democratic quality, restoration from fatigue, and its being effective to drive away wolves and other wild animals at night when a man is travelling alone.

The following three species were cultivated extensively in Japan in the 17th century : Nicotiana tabacum petiolata, Nicotiana tabacum Virginica, and Nicotiana macrophylla purpurae. SHIO SAKANISHI.

12. — ISRAEL

(Including works devoted to Palestine)

Baer, Fritz (1888-). Die Juden im christlichen Spanien. Erster Teil : Urkunden und Regesten, 1. Aragonien und Navarra.

xxviii+1175 p. (*Veröffentlichungen der Akademie für die Wissenschaft des Judentums, historiche Sektion*, 4). Berlin, Akademie-Verlag, 1929. ISIS

Fundamental. The author has been preparing this work (of which this volume is only a beginning) for almost twenty years. Witness his doctor's thesis, *Studien zur Geschichte der Juden im Aragonien während des 13. und 14. Jahrhunderts* (Freiburg i. Breisgau, 1912, printed Berlin 1913). G. S.

Gordon, Hirsch Loeb. Cenni di diritto e di procedura penale ebraica ed in particolar modo l'omicidio nel diritto penale ebraico dalle fonti originali. Giustizia penale, parte Ia, I presupposti del diritto e della procedura penale, anno 41, (1 dalla 5a serie), fasc. 7, 18 p. Città di Castello, Leonardo da Vinci, 1935. ISIS

Liber, M. Cinquante ans d'études juives (1880-1930). *Revue des études juives* 89, 1-25, 1930. ISIS

Margoliouth, G. Catalogue of the Hebrew and Samaritan manuscripts in the British Museum. Part IV: Introduction, indexes, brief descriptions of accessions and addenda and corrigenda by J. LEVEEN. London, 1935. ISIS

Simon, Sydney M. History of the Jewish physicians in the United States up to about 1900. *Annals of medical history* 7, 285-91, 1935. ISIS

Snowman, Jacob. A short history of Talmudic medicine. 94 p. London, BALE, Sons and DANIELSSON, 1935 (3/6). ISIS

"The following pages claim to be nothing more than a brief sketch of Talmudic medicine. This topic has been the subject of a voluminous literature, but the author has relied mainly on three comparatively recent works, viz. 'Biblisch-Talmudische Medizin', by JULIUS PREUSS, Berlin, 1911; 'Talmud and medicine' (Hebrew), by I. L. KATZENELSOHN, Berlin 1927; 'Midrash-Ha-Refuah' (Hebrew), by M. PEARLMAN, Tel-Aviv, 1929. Readers who wish to make a detailed study of the subject should consult these works, which are furnished with full references. The work by PEARLMAN is an exhaustive compendium of every medical reference which occurs in the Talmudical and cognate literature, carefully classified according to subject matter. For the production of this small volume, however, the classical work of PREUSS has been the main authority consulted." Contents: 1. The environment of Talmudic medicine; 2. Social status of physician; 3. Anatomy and physiology; 4. Applied physiology; 5. Causation and cure of disease; 6. Types of disease; 7. Surgery; 8. Circumcision, venesection, etc.; 9. Gynaecology and obstetrics; 10. Embryology and pediatrics; 11. Difficult labour; 12. The specialities — eyes, teeth, ears, nose; 13. Leprosy and skin lesions; 14. Comparative pathology.

Véhel, J.; Ryvel. Le bestiaire du ghetto. Folklore tunisien. 2 compositions originales de JULES LELLOUCHE. Illustrations de V. GUÉRASSIMOFF. Clichage calcographique de l'Imprimerie spéciale escano. 95 p. Tunis, Editions de la Kahéna, 1934. ISIS

Zeitlin, Solomon. Notes relatives au calendrier juif. *Revue des études juives* 89, 349-59, 1930. ISIS

13. — IRAN

Hess, J. - J. Tishtrya. *Oriental studies in honour of Cursetji Erachji Pavry*, 137-39, 1933. ISIS

" Tishtrya ist also eine Gruppe von Sternen, die im wesentlichen der indischen Mondstation Jyeṣṭhâ, der chinesischen Hsin 'das Herz' (des Drachen) und der arabischen al-Qalb 'das Herz' (des Scorpions) resp. σ α τ Scorpionis entspricht, aber noch einige andere oben angeführte Sterne umfasst."

Pahlavi codex K 35 (Codices avestici et pahlavici Bibliothecae Universitatis Hafniensis, 3). First part, published in facsimile by the University Library of Copenhagen, with an introduction by ARTHUR CHRISTENSEN. 7 p., 265 pl. Copenhagen, LEVIN & MUNKSGAARD, 1934. ISIS

Reviewed by E. BENVENISTE, *Journal asiatique* 225, 295, 1934.

Pavry, Cursetji Erachji (1859-). Oriental studies in his honour. Edited by JAL DASTUR CURSETJI PAVRY. With a foreword by A. V. WILLIAMS JACKSON. xvii + 503 p., portraits in frontispiece. Oxford University Press, 1933. ISIS

Biography by A. V. WILLIAMS JACKSON. A few articles of this *Festschrift* are analyzed in our *Critical Bibliography*. G. S.

14. — ISLAM (*also Arabia*)

Asín Palacios, Miguel. Contacts de la spiritualité musulmane et de la spiritualité chrétienne. *Cahiers du Sud* 22, 77-83, 1935. ISIS

'Aysa Iskandar al-Ma'lûf. Al-usar al-'arabiyyat al-mushtaharat bil-ṭib al-'arabī wa-ashhar al-makhṭūṭāt al-ṭibiyyat al-'arabiyyat (Arabic families famous in medicine and their medical writings). 60 p. in Arabic, privately printed at the expense of Dr. SĀMĪ ḤADDĀD, American University, Beirūt, Syria, 1935. ISIS

This is a brief history of Arabic medicine wherein special stress is laid on the family relationships of the early physicians. The author, member of the Arabic academies of Egypt, Damascus, and Beirût, and editor of the Journal Al-āthār, wrote a history of the Eastern families. The present volume reproduces the lectures he delivered at a medical conference held in May 1935, at the American University of Beirût. The first part deals with the East, the second with the Maghrib and Andalusia, the third with the most famous medical Arabic writings, especially the MSS. There are many illustrations of Arabic surgical instruments, and reproductions of anatomical diagrams taken from the MSS. With the exception of M. MEYERHOF, his references are exclusively Arabic. Let us hope that this volume will give the Arabic readers a better appreciation of the scientific achievements of their ancestors. G. S.

Bauer, H. al-Mushtari. *OLZ* 38, 477, 1935. ISIS

Discussion of the Arabic name of the planet Jupiter. G. S.

Bergsträsser, G. (1886-1933). Grundzüge des islamischen Rechts, bearbeitet und hrsg. von JOSEPH SCHACHT. viii + 145 p. (Lehrbücher des Seminars für Orientalische Sprachen zu Berlin, 35). Berlin, DE GRUYTER, 1935. ISIS

Reviewed by JOSEPH SCHACHT, *OLZ* 38, 593-99, 1935.

Bovill, E. W. Caravans of the old Sahara. An introduction to the history of the western Sudan. 300 p., 13 maps. Published for the International Institute of African languages & Cultures by Oxford University Press, 1935. ISIS

" The importance to Christian Europe of the trade which it so long carried on with the Muhammadan states of the North African littoral has always been accepted, but the extent of its dependence on the desert caravan traffic with the negroid peoples of the Western Sudan has been little recognized. The trans-Saharan trade wove ties of blood and culture between the the peoples north and south of the desert, and it inspired the achievements by which, after centuries of failure, the mysteries of the remote interior were ultimately revealed to European nations. The purpose of this volume is to outline briefly the growth of these associations and to win a measure of recognition for the part which the Western Sudanese have played in the history of civilization." A very remarkable book. G. S.

Helfritz, Hans. The first crossing of southwestern Arabia. *Geographical review* 25, 395-07, 14 fig., 1935. ISIS

Kratschkovsky, Ign. Die Literatur der arabischen Emigranten in Amerika (1895-1915). *Le monde oriental* 21, 193-213, 1927. ISIS

Laufer, Berthold (1874-1934). The noria or Persian wheel. *Oriental studies in honour of Cursetji Erachji Pavry* 238-50, 1933. ISIS

Madkour, Ibrahim. L'Organon d'ARISTOTE dans le monde arabe. Ses traductions, son étude et ses applications. Analyse puisée principalement à un commentaire inédit d'IBN SĪNĀ. Préface de SIMON VAN DEN BERGH. viii + 304 p. (*Bibliothèque d'histoire de la philosophie*). Paris, VRIN, 1934. (40 frs.). ISIS

1. Le mouvement traducteur de l'Islam; 2. La nature et l'objet de la logique; 3. La logique du concept; 4. La logique du jugement; 5. La logique du raisonnement; 6. La logique arabe après IBN SĪNĀ; 7. La méthodologie aristotélicienne et les sciences théologiques et juridiques de l'Islam.

Marçais, William. L'Islamisme et la vie urbaine. *Académie des inscriptions*, comptes rendus, 86-100, 1928. ISIS

" Les villes sont pour l'Islām les seuls lieux où ses adeptes puissent satisfaire à toutes les obligations de la loi, être intégralement, spécifiquement musulmans. Il a donc favorisé, et en fait, développé la vie urbaine. Par contre il a marqué au nomadisme de la méfiance et de l'antipathie, et en fait il l'a réduit. S'il ne l'a pas fait disparaître, c'est que sans doute, en beaucoup de pays musulmans, la transhumance pastorale demeure pour l'homme le seul genre possible d'existence, et c'est aussi qu'il ne suffit pas aux religions de condamner ou même d'anathématiser pour abolir."

Massignon, Louis. L'arabe langue liturgique de l'Islam. *Cahiers du Sud* 22, 71-76, 1935. ISIS.

Massignon, Louis. Notes sommaires sur la formation des noms abstraits en Arabe et l'influence des modèles grecs. *Revue des études islamiques* 507-11, 1934. (received Aug. 1935). ISIS

Meyerhof, Max. Esquisse d'histoire de la pharmacologie et botanique chez les Musulmans d'Espagne. *Al-Andalus* 3, 1-41, 1935. ISIS

Mohtar-Katirjoglou, Mahmoud. La sagesse coranique éclairée par des versets choisis reflétant la philosophie morale, religieuse & sociale de l'Islam. Suivis d'un exposé synoptique des enseignements du Coran. 261 p. Paris, GEUTHNER, 1935. (22 fr. ; relié 28 fr.). ISIS

Collection d'extraits du Coran préparée par le général MAHMOUD MOHTAR pacha et publiée après sa mort (1935) par les soins de sa veuve S. A. la princesse NIMET. De telles collections sont utiles, parce que le Coran est un peu long et monotone en traduction. G. S.

Renaud, H. P. J. La contribution des arabes à la connaissance des espèces végétales : les botanistes musulmans. *Bull. de la société des sciences naturelles du Maroc*, vol. 15, 14 pl., 1935. ISIS

Excellent résumé contenant plusieurs détails intéressants. G. S.

Renaud, H. P. J.; Colin, G. S. Documents marocains pour servir à l'histoire du " mal franc ". Textes arabes publiés et traduits avec une introduction. 124 p., 40 p. en arabe. (Publications de l'Institut des Hautes-études marocaines, 27). Paris, LAROSE, 1935. ISIS

Après avoir montré que les textes des anciens médecins arabes — tels qu'IBN SĪNĀ, ABŪL-QĀSIM AL-ZAHRĀWI, IBN AL-BAYṬAR, etc. ne font pas mention de la syphilis, les auteurs nous parlent des premiers textes relatifs à cette maladie, la description de LÉON L'AFRICAIN (XVI-1) et les traités de DĀ'ŪD B. 'UMAR AL-ANṬĀKI (d. c. 1598). Suivent quatre textes nouveaux qui sont les premiers documents arabes sur la syphilis dans l'Occident musulman (le premier est contemporain de AL-ANṬĀKĪ, les deux suivants du XVII[e] siècle, le dernier du XVIII[e]). Ces textes sont édités, traduits et commentés avec soin; ils ne peuvent rien nous apprendre sur les origines de la syphilis mais ils nous renseignent sur l'évolution de cette maladie dans les pays islamiques. Au Maroc elle fut traitée avec de la salsepareille appelée 'ushba (nom donné à toute herbe verte, mais la salsepareille était l'herbe par excellence); plus tard quand l'iodure de potassium eut remplacé la salsepareille, le peuple lui donna le vieux nom 'ushba. Les auteurs remarquent " L'usage de la salsepareille joint à celui des eaux thermales sulfureuses de Mawlāi Ya'qub, près de Fès, a résumé, depuis au moins deux siècles, le traitement de la syphilis au Maroc dans l'immense majorité des cas. Les spécialistes verront là, sans doute, comme en Algérie, la principale raison de la persistance chez les indigènes de ce qu'on nomme aujourd'hui le 'dermotropisme' de la syphilis exotique. L'insuffisance ou l'inactivité de leur thérapeutique a laissé se développer chez eux les accidents cutanés exubérants du type 'colombien', cette syphilis floride, dont le nom marocain de nuwwār (littéralement: fleurs), dépeint la caractéristique, et les a préservés généralement des redoutables complications nerveuses, de ce qu'on a appelé 'l'européanisation' de la syphilis." (p. 36). G. S.

Ritter, Helmut; Walzer, Richard. Arabische Übersetzungen griechischer Ärzte in Stambuler Bibliotheken. *Sitzungsberichte der preussischen Akademie der Wissenschaften*, phil. — hist. Klasse, 26, 48 p., Berlin, 1934 (RM 3). ISIS

It is hardly necessary to insist upon the importance of this catalogue for every student of Arabic science. Reviewed by M. MEYERHOF, *OLZ* 38, 524-25, 1935. G. S.

Sanz, José María. Alarifes moros aragoneses. *Al-Andalus* 3, 63-87, 4 pl., 1935. ISIS

Spoer, H. Henry. Arabic magic medicinal bowls. *Journal of American oriental society* 55, 237-56, 5 fig., 1935. ISIS

Ṭarâzî, Philip de. History of Arabic journalism. Including information on all the Arabic newspapers and magazines published in the world, East and West, together with biographies and portraits of their founders and main contributors. In 4 parts, Beirût 1913 to 1933. (in Arabic). ISIS

This is an extremely valuable and interesting work which helps us to understand the intellectual development of the Arabic world, and to appreciate its bewildering complexity. Part I, 160 p., 1913, part II, 336 p., 1913, part III, 96 p., 1914 were published by the Maṭba'a adabiyya of Beirût before the war. They contain an abundance of portraits and biographical sketches of men of letters of many countries & religions who helped to develop the Arabic press and were thus the main instruments of the Arabic revival. Part IV, 545 p. was published only in 1933 by the American Press of the same city, in conjunction with the American University. It is a list (in Arabic, but all titles and city names are translated into English) of all the newspapers and magazines arranged in geographical order. Incidentally this part may be conveniently used as a gazetteer. The work ends with various statistical summaries which are of unusual interest, and give one a vivid idea of the size of Mr. de Ṭarâzî's subject and of his energy.

The total number of periodical publications (journals and magazines) dealt with is more than 3000 (of course only a fraction of these are still going on to-day). They are subdivided by continents as follows : Africa 1563, Asia 1059, S. America 166, Europe, 133, N. America 102, total 3023.

The ten countries leading in the number of publications are : Egypt 1398, Lebanon 426, Syria 244, Iraq 220, Tunis 98, Brazil 95, Palestine 82, U. S. A. 79, Argentine 58, Turkey 47. (Morocco and Hejaz trail far behind, no. 18 and 19, with only 14 publications each !).

The ten leading cities are Cairo 1038, Beirût 294, Alexandria 208, Bagdad 182, Damascus 137, Tunis 94, Aleppo 69, New York 52, Sao Paulo 49, Constantinople 47. Note the immense superiority of Cairo. More than one third of all the Arabic periodicals of the world originated in that city !

1469 of those publications are Muslim, 1137 Christian, 48 Jewish, 37 represent other religions and 335 are neutral. The amazingly large number of Christian publications is due to the facts that Arabic journalism was created all over the world by Christian Syrians and that the vast majority of Arabic presses are in the Near East, where a great diversity of Christian communities emulate each other. Perhaps the most astonishing fact is, the relative silence of the Maghrib and of Arabia itself. It would be interesting to be able to compare these publications quantitatively, for they are of very different sizes : a few journals of Cairo have very large circulations while many Lebanese journals cater only to very small communities. However this is out the question, the 'auditing' of circulations being still unknown in the Arabic world. G. S.

Worrell, William H. More about Arabic terms for " rug ". *Ars Islamica* 2, 65-68 (no date, received Nov. 1935). ISIS

PART III

SYSTEMATIC CLASSIFICATION

I. — SCIENCE IN GENERAL

16. — HISTORY OF SCIENCE

(American Association for the Advancement of science). Berkeley meeting of the American association for the advancement of science (June 1934). Section of historical and philological sciences and History of science society. *Isis* 23, 258-59, 1935. ISIS

Enriques, Federigo ; de Santillana, G. Storia dèl pensiero scientifico. Vol. I : Il mondo antico. 682 p., 120 ills. Milan, TREVES, 1932. ISIS

Reviewed by GEORGE SARTON, *Isis* 23, 467-69, 1935.

(History of science society). Proceedings of the eleventh annual meeting of the History of science society. Washington, D. C. December 28 and 29, 1934. *Isis* 23, 299-308, 1935. ISIS

Contents : Revised statutes; Report of the program, Washington meeting, Dec. 1934; Report of the secretary to the president and council of the History of science society; Treasurers report; Council record, Meeting December 28, 1934; 5 P. M.; Summary of *Isis* accounts for 1934.

(History of science dinner club). Program of the history of science dinner club, University of California, Berkeley, California, for the academic year, 1933-1934. *Isis* 23, 257, 1935. ISIS

Hubert, René. Essai sur l'histoire de l'idée de progrès. *Revue d'hist. de la philosophie et d'hist. générale de la civilisation*, fasc. 8 et 9, 48 p., 15 Oct. 1934-15 janv. 1935. ISIS

Isis. Duties and responsibilities of its associate editors. *Isis* 23, 444, 1935. ISIS

Meisen, V. Prominent Danish scientists through the ages. With facsimiles from their works. 195 p. (University Library of Copenhagen, 450th anniversary). Copenhagen, LEVIN & MUNKSGAARD, 1932. ISIS

Reviewed by GEORGE SARTON, *Isis* 23, 276-78, 1935.

Metzger, Hélène. Tribunal de l'histoire et théorie de la connaissance scientifique. *Archeion* 17, 1-14, 1935. ISIS

" Le tribunal de l'histoire a-t-il qualité pour rendre des jugements permettant de clore les discussions soulevées par les philosophes, partisans des diverses théories de la connaissance scientifique? Peut-il prononcer en dernier ressort une sentence condamnant telles doctrines et approuvant telle autre doctrine soumise à son examen? "

Hylander, Clarence John. American scientists. xiii + 186 p., 16 pl. New York, MACMILLAN, 1935 ($2.00). ISIS

Brief biographical sketches of twenty-seven American scientists with portraits of seventeen. The names included are those of the physicists BENJAMIN FRANKLIN, BENJAMIN THOMPSON, JOSEPH HENRY, ROBERT A. MILLIKAN, ALBERT A. MICHELSON, and ARTHUR H. COMPTON; the astronomer SIMON NEWCOMB; the chemists BENJAMIN SILLIMAN, IRA REMSEN, THEODORE W. RICHARDS, and HAROLD C. UREY; the ornithologists ALEXANDER WILSON and JOHN J. AUBUDON, the botanists JOHN TORREY and ASA GRAY; the naturalists LOUIS AGASSIZ, ROY C. ANDREWS, and WILLIAM BEEBE; the zoologist DAVID STARR JORDAN; the biologist THOMAS H. MORGAN; the palaeontologists JOSEPH LEIDY, OTHNIEL C. MARSH, EDWARD D. COPE, and HENRY FAIRFIELD OSBORN; the geologist JAMES D. DANA; the engineer IRVING LANGMUIR; and the creator of new types of plants LUTHER BURBANK.

C. A. K.

Sarton, George. Forty-second Critical bibliography of the histo y and philosophy of science and of the history of civilization (to end of November 1934, — with special reference to the Middle Ages and Byzantium). *Isis* 23, 488-627, 1935. ISIS

" This forty-second Bibliography contains about 835 items of which 145 deal with the Middle Ages and Byzantium. They have been kindly contributed by fourteen scholars belonging to six different countries."

Sarton, George. The history of science versus the history of medicine. Second preface to volume XXIII. *Isis* 23, 313-20, 1935. ISIS

Sarton, George. The study and teaching of the history of science and of medicine in Rumania. *Isis* 23, 445, 1935. ISIS

Thalès. Recueil annuel des travaux de l'Institut d'histoire des sciences et des techniques de l'Université de Paris. Première année, 1934. xix + 184 p. Paris, FÉLIX ALCAN, 1935 (30 francs). ISIS

Nous saluons avec un plaisir tout spécial le premier volume d'un nouveau périodique consacré à nos études, l'annuaire de l'Institut de l'Université de Paris, dirigé par le professeur ABEL REY, bien connu des historiens de la science dans le monde entier. *Thalès* est rédigé par lui, aidé de MM.

DUCASSÉ et BRUNET. Ce premier volume contient beaucoup de renseignements sur l'enseignement de l'histoire des science à Paris: statuts de l'Institut, conditions d'obtention du certificat et du diplôme, etc. Les articles seront classés dans notre bibliographie, pour la première fois dans la 45e. *Vivat semper vivat* ! G. S.

17. — ORGANIZATION OF SCIENCE

(Internal organization is meant, see Isis 1, 195. *For external organization, national, or international, see section* 55).

Angell, James R. Popular and unpopular science. Elihu Root lectures of Carnegie Institution of Washington on the influence of science and research on current thought, 3-22, 1935. ISIS

Gruenberg, Benjamin C. Science and the public mind. With a foreword by JOHN C. MERRIAM. xiii + 196 p. New York, MCGRAW-HILL, 1935 ($2.00). ISIS

The author stresses the desirability of democratizing science through a wide-spread system of adult education. The reasons justifying this diffusion are threefold : it would advance the individual's interests and well-being; promote civic and social interests and advance common or cultural interests. Adopting a Comtean attitude, the author suggests that this would probably dispel superstition, stimulate reflection and reduce the authority of sheer tradition. The falacy in these arguments seem to be a failure to discriminate between the results of a thorough training of the intellectually superior in specific fields and a necessarily superficial acquaintance of the bulk of the population with science generally. Democratic values may father many unattainable, howsoever desirable, ideals. R. K. M.

Rainov, T. I. The many-sided scientist as a type. *Socialist reconstruction and science*, 101-27, 1934 (in Russian). ISIS

A study of the versatility of a research man working — either simultaneously or successively — in several fields usually reserved to "specialists". As far as the "individual psycho-physical constitution" of the many-sided scientist is concerned, the author rejects F. GIESE's theories of the successive splitting of the personality and the "Doppelbegabung" (Die öffentliche Persönlichkeit, Leipzig 1928); he does not accept the explanation offered by W. OSTWALD in "Grosse Männer". The author seems to be on solid ground when he discusses the influence on the work of the versatile scientist, of the "systematic connections" between the various domains of scientific knowledge; a far-reaching method or point of view may lead the scientist into new fields; again, the complexity of a given problem may lead a scientist to approach it from many sides, integrating knowledge belonging to several fields. Less convincing are the author's explanations of the relations between the work of a versatile scientist and the "social-political actuality"; thus, he devotes more than a page to the thesis that EINSTEIN's general theory

of relativity "represents a remarkable and certainly not accidental correlation with the interests and needs of the capitalistic technology of the period of pre-war imperialism". This paper deals with many-sided scientists in capitalistic countries; the author promises to discuss the versatile scientists in the USSR in a forthcoming paper. A. P.

Soddy, Frederick (editor). The frustration of science. With a foreword by FREDERICK SODDY. 144 p. New York, NORTON, 1935 ($2.00). ISIS

The keynote of the seven essays constituting this book is the incubus placed upon the practical utilisation of scientific knowledge by our social and economic organization. It is maintained that as long as entrepreneurial profit provides the rationale of our economic system there will intermittently arise a conflict between the canons of technological efficiency and of pecuniary returns. In short, each essay describes concrete conflicts of the sort which have long since been theoretically discussed by THORSTEIN VEBLEN (*The place of science in modern civilisation*). The solution, implied by the other contributors to the volume, and explicitly stated by P. M. S. BLACKETT, is the adoption of Socialism which wants "all the science it can get to produce the greatest possible wealth." Thus is obeyed the injunction in the foreword "to speak the truth though the heavens fall." The table of contents : science and agriculture (Sir DANIEL HALL), aviation (J. G. CROWTHER), science and industry (J. D. BERNAL), medicine (V. H. MOTTRAM), the invention of sterility (ENID CHARLES), bacterial warfare (P. A. GORER), and the frustration of science (P. M. S. BLACKETT). R. K. M.

18. — PHILOSOPHY OF SCIENCE

Birkhoff, G. D.; Lewis, D. C. jr. Stability in causal systems. *Philosophy of science* 2, 304-33, 1935. ISIS

Ducasse, C. J. Is scientific verification possible in philosophy? *Philosophy of science* 2, 121-27, 1935. ISIS

Einstein, Albert. The world as I see it. Translated by ALAN HARRIS. x + 214 p. London, LANE, Bodley Head, 1935. ISIS

The French edition of this book (Paris, 1934) was reviewed in *Isis* 23, 278-80.

Einstein, Albert. Comment je vois le monde. Traduit par le Colonel CROS. vi+258 p. (Bibliothèque de philosophie scientifique). Paris, FLAMMARION, 1934. ISIS

Reviewed by GEORGE SARTON, *Isis* 23, 278-80, 1935.

Frank, Lawrence K. Structure, function and growth. *Philosophy of science* 2, 210-35, 1935. ISIS

Kolman, E. On the problem of a unified physical theory of matter. *Philosophy of science* 2, 400-12, 1935. ISIS

Lassen, H. Der Umgebungsbegriff als Planbegriff. Ein Beitrag zu den erkenntnistheoretischen Grundfragen der Umweltlehre. *Arch. f. Gesch. d. Med. u.d. Naturw.* 27, 480-93, 1935. ISIS

Lupasco, Stéphane. La physique macroscopique et sa portée philosophique. 109 p. Paris, VRIN, 1935. ISIS

Contents : 1. Aspect prérelativiste de la physique; 2. La relativité restreinte; 3. La relativité généralisée; 4. Les cosmogonies macrophysiques; 5. La thermodynamique.

Merriam, John C. Ultimate values of science. Carnegie Institution of Washington, supplementary publications 15, 8 p., 1935. ISIS

Meyer, Adolf. Die Idée des Holismus. *Scientia* 18-29, juillet 1935. ISIS

Milne, E. A. Some points in the philosophy of physics : time, evolution, and creation. *Annual report of the Smithsonian Institution for the year* 1933, 219-38, Washington, 1935. ISIS

An address delivered to the British Institute of philosophy on Oct. 17, 1933. Reprinted by permission from *Philosophy*, January 1934.

Morris, Charles W. Philosophy of science and science of philosophy. *Philosophy of science* 2, 271-86, 1935. ISIS

Smuts, J. C. Die kausale Bedeutung des Holismus. *Archiv f. Gesch. d. Med. u. d. Naturw.* 27, 465-66, 1935. ISIS

Somerville, John. The forgotten problem : aims in science. *Philosophy of science* 2, 246-54, 1935. ISIS

Spoehr, H. A. The nature of progress in science. Elihu Root lectures of Carnegie Institution of Washington on the influence of science and research on current thought, 25-54, 1935. ISIS

Vassiliev, S. F. La théorie de la science d'EMILE MEYERSON, *Archives of the history of science and technology*, vol. 5, 57-100, Leningrad, 1935 (in Russian, with French summary). ISIS

Vassiliev, S. F. On the problem of the principle of observability. *Archives of the history of science and technology* 6, 1-31, 1935 (in Russian with English summary). ISIS

" This article is a critical review of the principle, expounded by HEISENBERG under the influence of BOHR's ideas, wherein he states that a physical theory must consist exclusively of observable values. The postulate that only observable values must be dealt with has its theoretical roots in MACH's philosophy, and is nothing more but a peculiar manner of expressing the phenomenological programme propounded by MACH. The actual physical content of this postulate can be reduced to a truism; for objectively there follows from it only the one idea — that a physical theory must deal only with elements which have a real significance, which have a real existence." " In analysing the essence of the principle of observability the author gives a short description of the basic philosophic ideas of BOHR and the Copenhagen school, on the one hand, and of the Cambridge school, on the other."

Weinberg, Julius R. Are there ultimate simples? *Philosophy of science* 2, 387-99, 1935. ISIS

Weyl, Herman. Mind and nature. viii+100 p. Philadelphia, University of Pennsylvania Press, 1934. ISIS

Reviewed by W. H. MCCREA, *Mathematical Gazette* 19, 58-9, 1935; and by H. T. DAVIS, *Isis* 23, 281-84, 1935.

Weyl, Hermann. The open world (Three lectures on the metaphysical implications of science). v+84 p. New Haven, Yale University Press, 1932. ISIS

Reviewed by H. T. DAVIS, *Isis* 23, 281-84, 1935.

II. — FORMAL SCIENCES (*knowledge of forms*)

19. — LOGIC AND THEORY OF KNOWLEDGE

Cohen, Morris R.; Nagel, Ernest. An introduction to logic and scientific method. xii+467 p. New York, HARCOURT, BRACE, 1934. IS..3

Reviewed by CHARLES MÂLIK, *Isis* 23, 284-87, 1935.

Kattsoff, Louis Osgood. Postulational methods. I. *Philosophy of science* 2, 139-63, 1935. ISIS

Lasker, Emanuel. On the definition of logic and mathematics. *Scripta mathematica* 3, 247-49, 1935. ISIS

Schilpp, Paul Arthur. The nature of the "given". *Philosophy of science* 2, 128-38, 1935. ISIS

20. — MATHEMATICS

Davis, Harold T. Tables of the higher mathematical functions. Computed and compiled. Volume 2, published as a contribution of the Waterman Institute for scientific research, Indiana University. xiii+391 p. Bloomington, Indiana, Principia Press, 1935. ISIS

The first volume of this great work (1933) was reviewed in *Isis* 21, 330-4. The present volume "includes 37 additional tables covering the Polygamma functions [derivatives of log $\Gamma(x)$], the Bernoulli polynomials and numbers, the Euler polynomials and numbers, and certain functions useful in unweighted polynomial approximation. These latter are closely related to the Legendre polynomials, being essentially the analogue of the Legendre polynomials for finite summation." It also contains a supplementary bibliography, and a beautiful portrait of J. W. L. GLAISHER (1848-1928). G. S.

Fettweis, Ewald. Arithmetik, Rasse und Kultur. *Archeion* 17, 64-73, 1935. ISIS

Hill, L. S.; Darkow, M. D. An algebraic treatment of geometry on a spherical surface. *Scripta mathematica* 3, 234-46, 1 pl., 1935.

Karpinski, Louis C. An exhibition of early textbooks on college mathematics. Prepared for the Ann Arbor meeting of the Mathematical Association of America, The American Institute of Statisticians, and the American Mathematical Society. Ann Arbor, 1935. ISIS

(Karpinski, Louis C.). Mathematica Americana. A guide to an exhibition in the William L. Clements Library at the University of Michigan, set up particularly for the meeting of the American Institute of Statisticians, the Mathematical Association of America, and the American Mathematical Society. 6 p. Ann Arbor, Sept. 1935. ISIS

Keyser, Cassius Jackson. Mathematics and the question of cosmic mind, with other essays. v+121 p. (Scripta mathematica library, 2). New York, Scripta mathematica, 1935. ISIS

"The following essays are reprints, with some alterations, of articles that have recently appeared in *The American Scholar*, the *Scripta Mathematica*, and the *Yale Law Journal*. For permission to republish the articles I desire to thank the editors concerned." Contents : The meaning of mathematics

The bearings of mathematics; Mathematics and the question of cosmic mind; Mitigating the tragedy of our modern culture; On the study of legal science; WILLIAM BENJAMIN SMITH."

Loria, Gino. Metodi matematici. Essenza — tecnica — applicazioni. xv+276 p., 51 fig. Milan, HOEPLI, 1935. ISIS

A book on mathematical methods by one of the masters of the history of mathematics, whose long life has been an almost uninterrupted meditation on these subjects, is very welcome indeed. It is very beautifully got up by HOEPLI. It is divided as follows. Book I. General methods : 1. Analysis and synthesis; 2. Reduction to the absurd; 3. Complete induction 4. Mathematical logic; etc. in all, 9 chapters. Book II. Geometrical methods, in 8 chapters. Book III. Methods relative to the science of numbers, in 4 chapters. G. S.

Saltykow, N. Histoire et évolution des mathématiques. *Enseignement mathématique* 33, 214-20, 1934. ISIS

Sánchez Pérez, José A. Sobre las cifras rûmîes. *Al-Andalus* 3, 97-125, many facs., 1935. ISIS

Important paper on numerals, including edition and analysis of an Escorial MS. (1933 delta), Kitāb fihi rashm al-zimām 'alā-l-tamām, wherein a number of numerals and accounting symbols are explained. It is a Moroccan MS dated April 1558. G. S.

Sanford, Vera. Roman numerals. *Mathematics teacher* 22-27, Jan. 1931. ISIS

Sarton, George. The first explanation of decimal fractions and measures (1585). Together with a history of the decimal idea and a facsimile (no. XVII) of STEVIN's *Disme*. *Isis* 23, 152-244, 1935. ISIS

Contents : 1. STEVIN's *Thiende*; 2. Progress of decimal numeration 3. Decimal fractions; 4. Decimal moneys, weights and measures; 5. Decimal division of angles and time; 6. The decimal idea; 7. The Anglo-American weights and measures; 8. Appendices.

Sergescu, P. Les mathématiques en Roumanie aux XVIII^e^ et XIX^e^ siècles (résumé). *Thalès* 1, 45-47, 1935. ISIS

Vygodskij, M. J. Les origines de la géométrie différentielle. *Archives of the history of science and technology* 6, 63-96, 1935 (in Russian with French summary). ISIS

This is the introduction to the Russian translation of MONGE's *Application de l'analyse à la géométrie*, which is to be published soon. G. S.

21. — STATISTICS

(History and methods. Tables and generalities. For the applications, refer to the sciences to which they are applied).

Davis, Harold T.; Nelson, W. F. C. Elements of statistics, with applications to economic data. xi+424 p., 50 fig. Bloomington, Indiana, Principia Press, 1935. ISIS

I had not planned to read this book but was gradually enticed into reading most of it. It is an excellent presentation of a great subject. " The illustrative materials and problems have been taken chiefly from data of economic significance. This lends, we believe, an atmosphere of coherence to the development such as is not attained when materials from a variety of disparate and unrelated disciplines are introduced in a capricious succession. The very pronounced drift in our day to a more fully quantitative science of economics would also seem to encourage such a concentration. In addition the authors' connection with the Cowles Commission for Research in Economics afforded opportunity for access to a variety of economic materials and original research." (p. x). Contents : 1. Preliminary analysis of statistical data; 2. The graphical analysis of data — elementary curve fitting; 3. Methods of averaging; 4. Index numbers; 5. The analysis of time series; 6. Analysis of artificial data — probability; 7. Binomial frequency distributions; 8. The normal frequency curve — problems in sampling; 9. Curve fitting; 10. Elements of correlation; 11. Multiple and partial correlation; 12. Types of statistical series. Various appendices contain mathematical notes and tables, and biographies of the early mathematical economists : ANTOINE AUGUSTIN COURNOT, WILLIAM STANLEY JEVONS, M. E. LÉON WALRAS, VILFREDO PARETO, F. Y. EDGEWORTH. Moreover the text includes valuable historical notes (which is not surprising when one of the authors is H. T. D.), e. g., on index numbers, analysis of time series, harmonic analysis. The book is beautifully got up, a good example of the high standards of printing of the Principia Press. G. S.

Irwin, J. O. Some aspects of the development of modern statistical method. *Mathematical Gazette* 19, 18-30, 1935. ISIS

A summary of the history of probability from PASCAL in 1650, and of statistical theory from QUETELET in 1835. C. W. A.

III. — PHYSICAL SCIENCES

(Knowledge of inorganic nature)

22. — MECHANICS *(Including celestial and atomical mechanics)*

Daujat, Jean. Note sur les origines de l'hydrostatique. *Thalès* 1, 53-56, 1935. ISIS

Ruja, Harry. SAMUEL ALEXANDER's concept of space-time. *Philosophy of science* 2, 188-209, 1935. ISIS

23. — ASTRONOMY

Aitken, Robert Grant. The binary stars. 2nd ed. xii+309 p., 4 pl., 13 fig., 3 port. New York, McGraw-Hill, 1935. ISIS

In addition to the " Historical sketch " which forms the first two chapters (40 pp.), there are numerous sections in other chapters which are of interest to the historian of astronomy. J. H. Moore revised, for the present edition, the chapter on " The radial velocity of a star," which he contributed to the 1st edition (1918). A. P.

Cox, J. F. Un siècle d'étude de la voie lactée. *Bull. technique de l'Association des ingénieurs sortis de l'Ecole polytechnique de Bruxelles*, 157-67, 1935. ISIS

Kennelly Arthur E. Proposed reforms of the Gregorian calendar. *Proceedings of the American philosophical society* 75, 71-110, 1935. ISIS

" It is proposed to present here an outline of the history of the Gregorian Calendar from the days of ancient Rome to the present time, to indicate the existing defects that have been recognised in this Calendar, and the principal proposals that have been suggested for reforming it, as based upon the reports of the Committee of the League of Nations, which has had the matter under consideration during the last ten years, also to indicate therefrom the reforms that may be feasible immediately."

Kowalski, Tadeusz. Zu den türkischen Monatsnamen. *Archiv orientalni* 2, 3-26, 2 pl., 1930. ISIS

Michel, Henri. Les instruments anciens de mathématiques des Musées d'art et d'histoire. *Bulletin des Musées royaux d'art et d'histoire* no 2, 26-34, 12 fig., 1935. ISIS

La plupart de ces instruments sont des cadrans solaires et des astrolabes. G. S.

Petrie, Flinders. Primitive astronomy. *Ancient Egypt and the East* 111-12, 1933. ISIS

Pogo, A. Solar saros series. With 1 fig. *Popular astronomy* 43, 335-44, 1935. ISIS

The fourth of a series of papers dealing with the periodicity of eclipses; see *Isis* 24, 517, 1936. The cylindrical diagram of solar saros series is based on the 8000 solar eclipses included in Oppolzer's *Canon der Finsternisse* (Wien, 1887). A. P.

Strong, Helen M. Universal world time. *Geographical review* 25, 479-84, 1935. ISIS

Stroobant, P. Aperçu de l'histoire de l'Observatoire royal de Belgique. *Bulletin astronomique de l'Observatoire royal de Belgique* 2, 5-11, 1935. ISIS

24. — PHYSICS

Berliner Physikalische Gesellschaft. Aus der Geschichte der Berliner Physik. Bildnis-Sammlung zur Feier des 90jährigen Bestehens der Berliner Physikal. Gesellschaft herausgegeben von der Bild- und Filmsammlung Deutscher Physiker. Physiker-Bildserie 1. 24 p. Leipzig, BARTH, 1935. ISIS

Introduction by E. BRÜCHE. Brief account of the Berliner Phys. Ges. 24 portraits each on a separate card with short biography. I owe this collection to IRIS RUNGE's kindness. G. S.

Broglie, Louis de. Coup d'œil sur l'histoire de l'optique. *Thalès* 1, 3-8, 1935. ISIS

Busacchi, Vincenzo. La scoperta del termometro e l'evoluzione della termometria clinica. *Rivista di storia delle scienze mediche* 26, 233-42, 1935. ISIS

Kramer, John B. The early history of magnetism. *Transactions of the Newcomen Society* 14, 183-200, 1933-34. ISIS

Larmor, Joseph. Physical units and their dimensions. *Nature* 136, 548, 1935. ISIS

Malisoff, William Marias. An examination of the quantum theories. IV. *Philosophy of science* 2, 334-43, 1935. ISIS

Margenau, Henry. Methodology of modern physics. *Philosophy of science* 2, 48-72, 164-87, 1935. ISIS

Mariani, Jean. La signification philosophique de la théorie des quanta. *Thalès* 1, 85-93, 1935. ISIS

" Le mémoire ne s'attache pas à l'histoire chronologique des diverses théories qu'il passe en revue. Il cherche uniquement à dégager la signification générale du mouvement historique qui, dans les sciences physiques, a conduit de la mécanique classique aux mécaniques actuelles. L'orientation de ce mouvement exprime le processus philosophique qui est au fond de l'évolution

scientifique elle-même. Elle met en évidence ce centre de perspective fondamental de l'histoire des sciences, celui qui lui donne, dans le développement de la pensée humaine, son intérêt propre, et montre à la fois la nécessité et la fécondité de son intervention."

Papanastassiou, Ch. E. Les théories sur la nature de la lumière de DESCARTES à nos jours et l'évolution de la théorie physique. 162 p. Paris, JOUVE, 1935. ISIS

Histoire des théories optiques divisée en deux parties : 1. Les théories anciennes, des premières recherches sur la nature de la lumière à la théorie électromagnétique (73 p.); 2. Les théories modernes sur la nature de la lumière et les difficultés soulevées par le dualisme des ondes et des corpuscules (63 p.). Suivie d'un Essai d'une représentation géométrique de l'évolution de la théorie physique. G. S.

Volkringer, H. Les théories sur la nature de la lumière (sommaire des conférences). *Thalès* 1, 57-58, 1935. ISIS

25. — CHEMISTRY, PHYSICO-CHEMISTRY, INDUSTRIAL CHEMISTRY

Amiel Jean. Quelques nouvelles théories de la valence chimique. *Thalès* 1, 155-60, 1935. ISIS

Aston, F. W. The story of isotopes. *Science* 82, 235-40, 1935. ISIS

Address of the president of the Section of Mathematical and physical sciences, British Association for the advancement of science, Norwich, September, 1935.

Baekeland, Leo Hendrik. Impress of chemistry upon industry. Bakelite an example. *Industrial and engineering chemistry* 27, 538-43, 1935. ISIS

Browne, C. A. The chemical industries of the American aborigines. *Isis* 23, 406-24, 1935. ISIS

Eliade, Mircea. Alchimia asiatica. I. Alchimia chineza şi indiana, 74 p. *Cultura poporului*, 1935. (Lei 40). ISIS

Notes on the history of Asiatic (Chinese and Hindu) alchemy, which are unfortunately sealed to most of the students of that fascinating subject, being written in Rumanian. This is very tantalizing ! G. S.

Findlay, Alexander. The teaching of chemistry in the Universities of Aberdeen. viii+92 p., 19 ills. (Aberdeen University studies, 112). Aberdeen, University Press, 1935. ISIS

Contents : Chemistry in the Universities of Aberdeen; The teaching of chemistry in Marischal college and University; The teaching of chemistry in King's College and University; The teaching of chemistry in the University of Aberdeen; Bibliography; Index.

Irving, H. An historical account of PHARAOH's serpents. *Science progress* 30, 62-66, 1935. ISIS

History of mercury thiocyanate. G. S.

Mackenzie, John E. The chair of chemistry in the University of Edinburgh in the XVIIIth and XIXth centuries. *Jour. Chem. Education* 12, 503-11, 1935. ISIS

" Dr. JAMES CRAUFURD (1713-26) appears to have been a most successful physician, if not a great professor of chemistry. Next come Dr. ANDREW PLUMMER and JOHN INNES (1726-55) as joint professors of medicine and chemistry. PLUMMER lectured on Chemical pharmacy, while INNES confined himself to medicine. WILLIAM CULLEN (1755-66), after some years in country medical practice, lectured on physic, materia medica, botany, and chemistry for eleven years in Glasgow, before coming to Edinburgh. He was a great physician and trained many students who came to fame, including his successor both in Glasgow and in Edinburgh, JOSEPH BLACK (1766-95)... THOMAS CHARLES HOPE (1795-1844), whose discovery of strontia is notable, was a most distinguished lecturer. WILLIAM GREGORY (1844-58), LYON PLAYFAIR (1858-69), and A. CRUM BROWN (1869-1908) bring us to the beginning of the twentieth century." T. L. D.

Metzger, Hélène. La philosophie de la matière chez les chimistes du XVII^e^ et du XVIII^e^ siècle. *Thalès* 1, 59-64, 1935. ISIS

Partington, J. R. Alchemy and music. *Nature* 136, 107, 1935. ISIS

Partington, J. R. Origin of chemistry : the definition of flame. *Nature* 135, 916, 1935. ISIS

26. — TECHNOLOGY

(For mining, see 32. *geology ; for industrial chemistry,* 25 *chemistry. See also Arts and crafts under* 45.)

Boyd, Thomas Alvin. Research. The pathfinder of science and industry. xvi+319 p. New York, APPLETON-Century, 1935. ($2.50). ISIS

This is a survey of the current status, methods, and achievements of research, largely in industrial lines, by the chief of the fuel section of the research division of General Motors Corporation. One section outlines

the qualifications required in the intellectual and aesthetic make-up of research men, and another describes the methods of recruiting and training talented men for industrial research. Industrial products have been improved by research. Incandescent lamps are now five times more efficient than when first made. SAVERY's steam engine (1600) consumed one hundred pounds of coal per horse-power hour to one pound or less in the improved engine of 1930. Television waited for the neon lamp and photo-electric cell. Research originates new industries. One-fourth of the General Electric Company's output results from discoveries since the World War. The aluminum industry as the result of HALL's (1886) discovery, now produces 200,000,000 pounds annually. Decades of research on cellulose have established many wholly new industries, such as the manufacture of rayon, and new applications in older industries. Chemical research has destroyed old industries such as the raising of indigo, and the use of Chilean nitrates for making ammonia and nitric acid. The auto, motor bus, and truck are displacing railroads : the radio, the phonograph. The greatest dividends from research are intellectual and humanitarian. There is a bibliography of nearly 200 titles.
C. A. K.

Dickinson, H. W. Presidential address : Museums and their relation to the history of engineering and technology. *Transactions of the Newcomen Society* 14, 1-12, 1933-34. ISIS

Garber, Ch. Das Problem der " Maschinerie " bei MARX. *Archives of the history of science & technology* vol. 5, 1-55, Leningrad, 1935 (in Russian with German summary). ISIS

Jenkins, Rhys. Historical notes on some Derbyshire industries. *Transactions of the Newcomen Society* 14, 163-77, 1933-34. ISIS

Malcolm, L. W. G. Early history of the streets and paving of London. *Transactions of the Newcomen Society* 14, 83-94, 1933-34. ISIS

Mitman, Carl W. An outline development of highway travel, especially in America. *Annual report of the Smithsonian Institution* 325-45, 12 pl., 1934. ISIS

Raistrick, A. The London Lead company, 1692-1905. *Transactions of the Newcomen Society* 14, 119-48, 1933-34. ISIS

Raskin, N. Sur l'histoire du cylindre (hollander). *Archives of the history of science and technology* 6, 117-37, 1935 (in Russian with French summary). ISIS

Read, Thomas T. The early casting of iron. A stage in Iron Age civilisation. *Archives of the history of science & technology*, vol. 5, 273-85, 7 fig., Leningrad, 1935 (in Russian). ISIS

Russian translation of the article published in *Geographical review* 24, 544-54, 1934 (*Isis* 23, 589).

Rostovzov, I. A. Manuels de l'art de tourner au XVIII-ème siècle. *Archives of the history of science and technology* 6, 139-70, 1935 (in Russian with French summary). ISIS

Siverzev, I. N. Ein Abriss der Geschichte des Eisenbetonschriffbaues. *Archives of the history of science and technology* 6, 249-78, 21 fig., 1935 (in Russian with German summary). ISIS

Strumilin, S. G. Siderurgy in Russia and in the USSR. Technological progress during three centuries. Publications of the Inst. Hist. Sc. & Technol., series 2, issue 4.324 p., 2 fig. Moscow, Acad. of Sciences USSR, 1935 (12 rbls.; bound, 14 rbls). ISIS

A well documented and very readable study of the history of siderurgy in Russia, stressing the economic rather than the technological point of view. The statistical material is clearly presented in 84 numbered large tables, and in numerous unnumbered small tables. The Feudal period (1632-1861) and the Capitalistic period (1861-1917) receive a more detailed treatment than the Soviet period (1917-1934). A. P.

Zeitlin, E. A. The first steps of mechanical flax-spinning in Russia. *Archives of the history of science & technology* vol. 5, 381-433; vol. 6, 211-47. Leningrad, 1935 (in Russian, with English summary). ISIS

IV. — BIOLOGICAL SCIENCES

(*Knowledge of organic nature*)

27. — BIOLOGY

(*generalities, " natural history "*)

Adams, C. C. The relation of general ecology to human ecology. *Ecology* 16, 316-35, 1935. ISIS

Bounoure, Louis. La conception d' " être vivant " et le domaine de la biologie générale. *Revue générale des sciences* 46, 331-40, 495-504, 1935. ISIS

Brock, Friedrich. Stellung und Bedeutung der autonomen Biologie und Umweltforschung im Rahmen der hierarchischen Pyramide der Wissenschaften. *Archiv. f. Gesch. d. Med. u. d. Naturw.* 27, 467-79, 1935. ISIS

Dobzhansky, Th. A critique of the species concept in biology. *Philosophy of science* 2, 344-55, 1935. ISIS

Fischel, Werner. Abstammungslehre und Tierpsychologie. *Archiv für Gesch. d. Med. u. d. Naturw.* 27, 511-15, 1935. ISIS

Keith, Sir Arthur. Darwinism and its critics. (The Forum series 20). viii+56 p., port., London, WATTS, 1935 (1 s). ISIS

The Evolution protest movement (1935) in London, the Presidential address of Sir AMBROSE FLEMING of the Victoria Institute defending the literal truth of the Biblical account of creation, CHESTERTON's insinuations that HUXLEY and SPENCER valued Darwinism as an argument for agnosticism, the attack of Father WOODLOCK (S.J.), upon DARWIN, and H.J. MASSINGHAM's statement in the *Times* that " the fangs of the Darwinian theory have been gradually drawn," have all conspired to rouse a spirited counter offensive in this booklet. It contains many historical references as a background for this offensive. C. A. K.

Laignel-Lavastine, Maxime. Etudes morphologiques : transformisme. *Thalès* 1, 9-28, 1935. ISIS

Lane, Alfred C. Eutopotropisme. *Scientia*, 6 p., aprile 1935. ISIS

" L' 'eutopotropisme ' peut se définir comme un tropisme par rapport au milieu auquel, à cause de variations préadaptées, on est le plus propre. "

Schmid, Günther. Über die Herkunft der Ausdrücke Morphologie und Biologie. Geschichtliche Zusammenhänge. *Nova acta leopoldina*, EMIL ABDERHALDEN, 597-620, Halle (Saale), 1935. ISIS

Zirkle, Conway. The inheritance of acquired characters and the provisional hypothesis of pangenesis. *American naturalist* 69, 417-45, 1935. ISIS

" 1. LAMARCK was neither the first nor the most distinguished biologist to believe in the inheritance of acquired characters. He merely endorsed a belief which had been generally accepted for at least 2,200 years before his time and used it to explain how evolution could have taken place. The inheritance of acquired characters had been accepted previously by HIPPOCRATES, ARISTOTLE, GALEN (?), ROGER BACON, JEROME CARDAN, LEVINUS LEMNIUS, JOHN RAY, MICHAEL ADANSON, JO. FRIED. BLUMENBACH and ERASMUS DARWIN among others. 2. If we wish to trace the history of evolution, we should search for naturalists who lived before LAMARCK and who did not believe in the inheritance of acquired characters. BROCK listed but two, (1) the unknown editor of ARISTOTLE's ' Historia animalium ', and (2) the philosopher, IMMANUEL KANT. 3. The dogma of the immutability of species met with general acceptance only late in the eighteenth and early

in the nineteenth century. Botanists from the time of THEOPHRASTOS to the time of LINNAEUS believed in 'degeneration.' 'Degeneration' did not then have its modern meaning, but was synonymous with De Vriesian mutation. Belief in degeneration was not incompatible with belief in special creation, as its effects were supposed to be neither orderly nor cumulative. 4. In order to understand what CHARLES DARWIN meant by his provisional hypothesis of pangenesis, it is necessary that we do not give to the terms he used the meanings which they acquired during the twentieth century. DARWIN's conception of the germ-plasm was not the one currently accepted. He considered the theory that the foetus was produced from an egg fertilized by a single spermatozoan but rejected it. He believed that the whole semen was a fertilizing substance and that the foetus resembled the father in proportion to the amount of semen ejaculated in coition. Furthermore, he believed in telegony and in the specific influence of semen upon the mother's body. 5. The hypothesis of pangenesis is as old as the belief in the inheritance of acquired characters. It was endorsed by HIPPOCRATES, DEMOCRITUS, GALEN (?), CLEMENT of Alexandria, LACTANTIUS, ST. ISIDORE of Seville, BARTHOLOMEUS ANGLICUS, ST. ALBERT the Great, ST. THOMAS of Aquinas, PETER of Crescentius (?), PARACELSUS, JEROME CARDAN, LEVINUS LEMNIUS, VENETTE, JOHN RAY, BUFFON, BONNET, MAUPERTIUS, von HALLER and HERBERT SPENCER. A careful search of our available records should add a number of names to this list."

28. — BOTANY

(Agronomy, Phytopathology, Palaeobotany)

Artignan, J. Les plantes de l'antiquité classique, sisumbrium. *Revue des études arméniennes* 1, 117-20, 1920. ISIS

" Le sisumbrium est le menthe-coq, *tanacetum balsamita* L., que le peuple arménien, gardien fidèle de l'antique civilisation, malgré toutes les vicissitudes de sa vie, a conservé intact sous la forme de sissambar."

Gandz, Solomon. Artificial fertilization of date-palms in Palestine and Arabia. *Isis* 23, 245-50, 1935. ISIS

1. Plant sexuality; 2. Individual love between palm trees; 3. The palm-gardeners of Jericho; 4. The process of fertilization; 5. Terminology; 6. The Babylonian palm trees.

Gray, Lewis Cecil. History of agriculture in the Southern United States to 1860. Assisted by ESTHER KATHERINE THOMPSON. With a foreword by H. C. TAYLOR. 2 vols. vol. 1, xxi+7+567 p. 1 map; vol. 2, x+p. 568-1086, 12 fig. Washington, Carnegie Institution, 1933. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 289, 1935.

Hedrick, Ulysses Prentiss. A history of agriculture in the state of New York. xiv+462 p., 82 pl., 41 fig., 2 maps. Geneva, N. Y., New York State Agricultural Society, 1933. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 287-88, 1935.

Messedaglia, Luigi. Per la storia delle nostre piante alimentari il mais o granoturco. *Rivista di storia delle scienze mediche e naturali* 26, 59-84, 1935. ISIS

Torkomian, Vahram H. A propos de l'histoire de la plante " kousso ". Communication faite au VI[e] Congrès international de médecine tenu à Leyde du 18 au 23 juillet 1927. *Revue des études arméniennes* 8, 33-38, 1928. ISIS

" Il y a plus d'un siècle que la plante Kousso ou Cousso, en tant qu'anthelmintique, figure dans la nomenclature thérapeutique; un médecin français le docteur A. BRAYER, exerçant à Constantinople, a eu l'occasion de la connaître, grâce à un Arménien qui n'était ni médecin, ni pharmacien, et de l'importer à Paris en 1822, pour la soumettre à l'examen du célèbre botaniste KUNTH." Ce dernier lui donna son nom scientifique *Brayera anthelmintica*. G. S.

29. — ZOOLOGY

Balss, Heinrich. Über die Deutung von weniger bekannten Fabeltieren in wissenschaftlichen Drucken des 15. bis 17. Jahrhunderts. *Philobiblon* 8, 288-94, figs., 1935. ISIS

Dakin, William J. Whalemen adventurers. The story of whaling in Australian waters and other Southern Seas related thereto, from the days of sails to modern times. xx+263 p., 42 pl., 2 maps. Sydney, ANGUS & ROBERTSON, 1934 (15 s.). ISIS

Whaling has had intimate relations to exploration and natural history, especially in the South Seas and the Antipodes. Professor DAKIN has rendered a service to history in these two fields by his accounts gathered from reliable and original sources, of the whale fisheries in Australasian waters and the South Seas adjacent thereto. He gives accounts of the whaling grounds, the varieties of whales taken, their life histories, the ships, crews, equipment, methods of capture and treatment of the catch, conditions created among native South Sea islanders by whaling crews, international rivalries, and the outstanding characters in the whaling industry. C. A. K.

Gèze, J.-B. La courtilière existait-elle dans la Grèce antique? *Académie des inscriptions*, comptes rendus, 47-50, 1931. ISIS

Apropos of *Gryllotalpa vulgaris*. G. S.

Junk, Wilhelm. Bibliographia coleopterologica. xv+p. 149-323, port. Den Haag, 1935 (10 s.). ISIS

Handsomely bound volume containing *Das Werden einer grossen Encyclopaedie*, and the catalogue no. 87 above mentioned. G. S.

Junk, Wilhelm. Dipterologi. 24 p. Den Haag, Scheveningsche Weg, 74, 1935 (Holl. fl. 1.25). ISIS

List of dipterologists all over the world, together with their addresses and special fields of study. G. S.

V. — SCIENCES OF THE EARTH

(Implying knowledge of both organic and inorganic nature)

31. — GEOGRAPHY and OCEANOGRAPHY

Beaglehole, J. C. The exploration of the Pacific. xv+411 p. London, BLACK, 1934. ISIS

Reviewed by G. R. CRONE, *Geographical journal* 85, 97-98, 1935. "Covers no new ground, but concentrates on the ideals and achievements of the outstanding navigators." C. W. A.

Bévenot, Hugh. "Wind-blowers." Answer to query no. 22 (*Isis* 19, 503). *Isis* 23, 253, 1935. ISIS

Chassigneux, Edmond. Rica de oro et rica de plata. *T'oung pao* 30, 37-84, 1933. ISIS

History of those real or imaginary islands. G. S.

Dickinson, R. E.; Howarth, O. J. R. The making of geography. iv+264 p., 5 pl., fig. Oxford, Clarendon Press, 1933. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 294, 1935.

Hoel, Adolf. The discovery of King Karl Land, Spitsbergen. *Geographical review* 25, 476-78, 1 fig., 1935. ISIS

First sighted in 1617 then forgotten; rediscovered in 1853 by the Norwegian sea captain E. ERIKSEN. "ERIKSEN discovered King Karl Land six years before ELLING CARLSEN and made a landing there 13 years before any other explorer. He went ashore on the Svensköya (Swedish Foreland) and so discovered Rivalen Sound 30 years before HEMING ADREASSEN." G. S.

Hyde, Walter Woodburn. The Alps in history. *Proceedings of the American philosophical society* 75, 431-42, 1935. ISIS

Karpinski, Louis C. Cartographical collections in America. *Imago Mundi*, 62-64, 1935. ISIS

This list gives me a general idea of the wealth of cartographical materials already available to American scholars. G. S.

Margerie, Emm. de. La méthode des courbes structurales et la tectonique du Colorado. *Osobne odbicie ze Zbioru Prac poświeconego Eugenjuszowi Romerowi*, 617-43, map, 1934. ISIS

Cet article, écrit pour le livre jubiliaire en l'honneur du Prof. EUG. ROMER, discute les mérites et défauts respectifs des hachures et des courbes de niveau, et résume l'histoire de ces méthodes. Il est donc important pour l'historien de la cartographie. G. S.

Mirsky, Jeannette. To the North ! The story of Arctic exploration from the earliest times to the present. With an introduction by VILHJALMUR STEFANSSON. xx+386 p., 16 pl., 13 maps, 9 fig., New York, Viking Press, 1934. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 483-85, 1935.

Oberhummer, Eugen. Medizinische Geographie. *Petermanns geographischen Mitteilungen* H. 9-10, 329-41, 1935. ISIS

General summary of the subject with abundant references. G. S.

Taylor, E. G. R. Tudor geography, 1485-1583. xii+290 p., 16 fig. London, METHUEN, 1930. ISIS

Reviewed by FRANCIS R. JOHNSON, *Isis* 23, 289-94, 1935.

Taylor, E.G.R. Late Tudor and early Stuart geography. 1583-1650. xiv+322 p., 8 fig. London, METHUEN, 1934. ISIS

Reviewed by FRANCIS R. JOHNSON, *Isis* 23, 289-94, 1935.

33. — METEOROLOGY, CLIMATOLOGY, AND TERRESTRIAL PHYSICS

Stone, Robert G. The history of mountain meteorology in the United States and the Mount Washington observatory. *Transactions of the American Geophysical Union* 124-33, 15th annual meeting, 1934. ISIS

Stone, Robert G. Die Entwicklung der amerikanischen Bergobservatorien und das derzeitige Netz von Bergstationen in den Vereinigten Staaten von Amerika. *Jahresbericht des Sonnblick-Vereines*, 30 p., 2 fig., 1934. ISIS

VI. — ANTHROPOLOGICAL AND HISTORICAL SCIENCES

(Knowledge of man, past and present)

34. — ANATOMY

Ashley-Montagu, M. F. The location of the nasion in the living. *American journal of physical anthropology* 20, 81-93, 1 fig., 1935. ISIS

Ashley-Montagu, M. F. The premaxilla in the primates. *Quarterly review of biology* 10, 32-59, 3 fig., 181-208, 11 fig., 1935. ISIS

Tricot-Royer, Dr. La figuration de l'ame dans l'art chrétien. *Aesculape*, 16 p., illus. (s. d.). ISIS

35. — PHYSICAL ANTHROPOLOGY

(Anthropometry and races of man)

De Lint, J. G. Vijflingen. *Bijdragen tot de geschiedenis der geneeskunde* 15, 185-96, 1 pl., 1935. ISIS

De Lint, J. G. Meervoudige geboorten. *Bijdragen tot de geschiedenis der geneeskunde* 15, 201-07, 2 fig., 1935. ISIS

Haddon, Alfred C. History of anthropology. xiv+144 p., illus. (The thinker's library, no. 42). London, WATTS, 1934 (1 s.). ISIS

" When it was suggested I should bring out a second edition of *The history of anthropology* I soon found that it was possible to retain only relatively small portions of the first edition, in which I was so ably helped by Mrs. A. HINGSTON QUIGGIN. There is indeed so much new matter that this is virtually a new book." Contents : Human biology, 1. The pioneers of physical anthropology; 2. The systematization of physical anthropology; 3. The older anthropological controversies; 4. The unfolding of the antiquity of man; 5. Individual and ethnic psychology; 6. The classification and distribution of man; Cultural anthropology, or ethnology. 7. The history of archaeological discovery; 8. Linguistics; 9. The growth of ethnology. Comparative sociology; 10. Sociology (including religion).

A marvelous book for its size and price. G. S.

Hrdlička, Aleš. Melanesians and Australians and the peopling of America. 58 p. (*Smithsonian miscellaneous collections*, 94, no. 11). Washington, 1935. ISIS

Elaborate review of the question including critical bibliography. "The only conclusion that appears possible in view of all the facts is that the hypotheses of either Melanesian or Australian, and even that of recognizable Polynesian, presence on the American continent is not demonstrable, nor even probable; that the dolicho-steno-hypsicephalic cranium is not extraneous but represents one of the several cranial types of both the Indian and the Eskimo; and that whatever cultural or other resemblances may appear to exist between the pre-Columbian Americas and the South Seas must have other explanations than any material accession of the peoples of the latter parts of the world to the American populations." G. S.

37. — PSYCHOLOGY

(human and comparative)

Boring, Edwin G. The relation of the attributes of sensation to the dimensions of the stimulus. *Philosophy of science* 2, 236-45, 1935. ISIS

Tolman, Edward Chace. Psychology versus immediate experience. *Philosophy of science* 2, 356-80, 1935. ISIS

38. — ARCHAEOLOGY

(Generalities, methods. History of archaeology and erudition)

Collins, Henry B., jr. Archeology of the Bering Sea region. *Annual report of the Smithsonian Institution for the year ending* 1933, 453-68, 11 pl., Washington, D. C., 1935. ISIS

"The origin of the Old Bering Sea culture is a problem requiring excavations not only around Bering Strait, where it reached its highest development, but also in northeastern Siberia, where it may have existed in an earlier form. The ultimate roots of this old Eskimo culture may lie still farther westward. The oldest phase of the Old Bering Sea culture has yielded a few examples of geometric art and carving in the round which resemble the upper Paleolithic art of Europe. These may or may not be significant. Of more importance, perhaps, is the fact that some of the oldest known Eskimo harpoon heads—those of the Old Bering Sea and Birnirk cultures—are equipped with small stone side blades, a technique which was also common in northern Europe during the Maglemosian period. It should be noted also that certain Iron age objects from Scandinavia, particularly bronze fibulae from southern Sweden and the adjacent islands of Bornholm and Öland, bear designs which are suggestive of Old Bering Sea art and even more so of prehistoric Ainu art. It may be because of the limitation of our knowledge that these appear now as only isolated resemblances. Little is known of the archeology of the greater part of central Siberia and nothing at all of the Siberian Arctic coast. Excavations in these regions might close the gaps and bring to light a series of old related cultures, forming an earlier parallel to the present general uniformity of culture in the circumpolar zone."

39. — PREHISTORY

Desch, Cecil H. The origin of bronze. *Transactions of the Newcomen Society* 14, 95-102, 1933-34. ISIS

"The object of this short paper is to state a problem rather than to offer a solution. The traditional classification of prehistoric times into Stone, Bronze, and Iron Ages has proved to be insufficient. The word bronze, which denotes an alloy consisting principally of copper and tin, was used in a loose sense, and many objects, classed as bronze from their appearance only, have proved to be copper. Many archaeologists have therefore supposed that the Bronze Age was preceded by a Copper Age, sometimes regarded as of great duration. The introduction of bronze is then regarded as having been at first accidental, tin being added in varying proportion, until in course of time experience showed that the composition of modern gun metal, approximately 90 per cent copper and 10 per cent tin, was the most generally useful. A case for this view could be made out by comparing the analyses of early metal implements from Asia, Egypt, and Europe. This view appeared most probable if it were assumed that copper was first used in the form of native metal, being hammered into shape without melting. Later the art of casting was discovered, but as pure copper can only be cast in an open mould, additions were made which increased the fluidity, and of these additions tin proved to be the most useful, so that in course of time tin bronze superseded copper and its alloys with arsenic or antimony. The metal tin was not known until a comparatively late date, so that it must have been added in the form of the mineral cassiterite, or obtained in the course of smelting a mixed ore of copper and tin." "The question of European sources of tin has not been mentioned, although it plays an important part in all the older discussions on the origin of bronze. The analyses reported by the Committee prove that true bronze was made in Sumerian regions at such an early date that importation from Britain or Spain cannot be assumed. Bronze must have originated in the East, and for further light to be thrown on its origin an examination of ores, especially of superficial deposits from such countries as Anatolia, Northern Persia and Baluchistan must be made. The problem : how the fact was discovered that copper could be both hardened and rendered more fluid for casting by the addition of tin, remains unsolved, and is in fact the greatest mystery in the study of early metallurgy."

Roberts, Frank H. H., jr. A Folsom complex. Preliminary report on investigations at the Lindenmeier site in Northern Colorado. 35 p., 16 pl. (*Smithsonian miscellaneous collections*, 94, no. 4). Washington, 1935. ISIS

See *Nature* 136, 535-8, 1935.

Shorr, Philip. The genesis of prehistorical research. *Isis* 23, 425-43, 2 pl., 1935. ISIS

Prehistory of prehistory, or history down to 1859, with portrait of PHILIPPE CHARLES SCHMERLING (1791-1836), the real pioneer in 1833, ahead of BOUCHER DE PERTHES (1847-49). G. S.

Strong, William Duncan. An introduction to Nebraska archeology 323 p., 25 pl. (*Smithsonian miscellaneous collections*, 93). — Washington, D. C., 1935. ISIS

" Dimly seen at the bottom of the time scale are evidences of early hunters, in some cases associated with extinct animals, presumably in early recent or late pleistocene times. Thus the hypothesis of early man in the Plains region is being verified, though the earliest evidence is still somewhat obscure both as to the exact time and the type of the cultures involved."

Tricot-Royer, Dr. Considérations d'ordre médical en faveur du gisement de Glozel. *Bruxelles-Médical* no 50, 4 p., 1928. ISIS

Vayson de Pradenne, A. The world-wide expansion of neolithic culture. *Antiquity* 9, 305-10, 1935. ISIS

Translated from *L'Anthropologie* 44, 719-23, 1934.

Vouga, Paul. Classification de néolithique lacustre suisse. 31 p., 8 pl., 11 fig. *L'indicateur des antiquités suisses*, no. 2 & 3, 31 p., 1929. ISIS

Vouga, Paul. Le néolithique lacustre ancien. 74 p., 24 pl. (Recueil de travaux publiés par la Faculté des lettres, 17e fascicule). Paris, GEUTHNER, 1934. ISIS

The progress of prehistoric research is astounding. Since the foundation of lake-dwelling archaeology by FERDINAND KELLER in 1854 (*Isis* 22, 308-11, portrait) that branch of archaeology has developed considerably. A new development was started by the author in Neuchâtel in 1920 with the discovery of a lower stratum—the ancient neolithic, different from the three strata already investigated : middle and recent neolithic, and eneolithic. Prof. VOUGA's survey of that new culture is justified as follows : " Deux considérations surtout m'ont engagé à ne plus différer cette publication : d'abord, je crois posséder tous les éléments essentiels en ce qui concerne le mobilier des premiers palafitteurs de notre région: ensuite, la plupart de mes confrères qui m'ont fait l'honneur de me citer n'ont pas réalisé pleinement l'importance de cette toute première culture néolithique et l'abîme qui la sépare des trois périodes suivantes." G. S.

40. — ETHNOLOGY

(Primitive and popular science)

Blom, Frans. Commerce, trade, and monetary units of the Maya. *Annual report of the Smithsonian Institution*, 423-40, 1 fig., 1934. ISIS

Reprinted by permission from Middle American Research series, publ. no. 4, " Middle American papers," the Tulane University of Louisiana, 1932.

Browne, C. A. The chemical industries of the American aborigines. *Isis* 23, 406-24, 1935. ISIS

Cherblanc, Emile. Mémoire sur l'invention du tissu (*Histoire générale du tissu*. Document no. 1). Quarto, 75 p., 6 pl. Paris, Editions d'art et d'histoire, 1935. ISIS

Clements, Forrest E. Primitive concepts of disease. University of California publications in American archaeology and ethnology 32, 185-252, 4 maps, 1932. (75 cents) ISIS

This is a capital contribution to the study of primitive medicine, a model which if it were followed for the investigation of other similar questions, would enable us finally to obtain a satisfactory knowledge of primitive sciences. Says the author : " The object of the present study is to offer a scheme of classification for the disease concepts of primitive peoples; to obtain a fairly complete geographical distribution of the classified concepts; and to frame certain conclusions as to their relative antiquity, probable origin, and historical connections. Such a study affords a good opportunity for the application of general methodological principles, thus involving one of the most basic questions of modern theoretical anthropology—the interpretation of cultural similarities and the convertibility of distributions in space into time sequences." The six primitive concepts of disease : sorcery, breach of taboo, disease-object intrusion, spirit intrusion, possession, soul loss, are discussed, tabulated and mapped. The account is brief, clear, to the point. The author, born in Princeton, Missouri, in 1900 is professor of anthropology at the University of Oklahoma. G. S.

Davidson, D. S. Is the boomerang Oriental? *Journal of the American Oriental society* 55, 163-81, 1935. ISIS

Laoust, E. Mots et choses berbères. Notes de linguistique et d'ethnographie, dialectes du Maroc. xx+531 p., 112 fig., 4 pl. Paris, CHALLAMEL, 1920. ISIS

Je dois à mon ami le Dr. RENAUD de Rabat la connaissance de cet admirable volume, et conformément à mes habitudes je m'empresser de partager ma nouvelle acquisition avec les lecteurs d'*Isis*. Le titre décrit fort bien l'ouvrage : Mots et choses berbères, car celui-ci nous fait connaître à la fois la langue et toutes les choses que celle-ci représente. La matière abondante est divisée comme suit : Introduction. 1. L'habitation; 2. Le mobilier; les ustensiles; 3. La nourriture; 4. A. Le corps humain; B. Les vêtements; 5. Infirmités et maladies; 6. Le temps, l'atmosphère, le ciel; 7. La culture — Le labourage; 8. La moisson — Le dépiquage — L'ensilage; 9. Le jardin et le verger; 10. Le végétal — La forêt — Flore berbère.

En somme cet ouvrage est une vraie encyclopédie berbère. G. S.

Mathiassen, Therkel. Eskimo migrations in Greenland. *Geographical review* 25, 408-22, 9 fig., 1935. ISIS

Schumacher, P. La phonétique du Kingarwanda. *Anthropos* 24, 77-86, 1929. ISIS

Article consacré aux noms de nombres et à la terminologie arithmétique. J. P.

Spinden, Herbert J. Indian manuscripts of Southern Mexico. *Annual report of the Smithsonian Institution for the year ending* 1933, 429-51, 3 pl., 13 fig., Washington, D. C., 1935. ISIS

41. — SUPERSTITION AND OCCULTISM

Blanton, Wyndham B. Madstones, with an account of several from Virginia. *Annals of medical history* 7, 268-73, 2 fig., 1935. ISIS

Marinus, Albert. Quelques problèmes de méthode dans l'étude de la magie. *Bull. de la Société royale d'anthropologie et de préhistoire* 48, 49-66, 1933. ISIS

Tricot-Royer, Dr. Le bilan du traitement de la rage à l'intercession de Saint-HUBERT et plus spécialement à Saint-HUBERT d'Ardennes. *Revue anthropologique* 34, 4 p., 1924. ISIS

42. — ECONOMICS

(Economic doctrines and history, commerce. Transportation and communications)

Edwards, Everett E. A list of American economic histories. 17 p. (mimeographed). Washington, D. C., U. S. Dept. of Agriculture, Bureau of Agricultural Economics, 1934. ISIS

43. — SOCIOLOGY, JURISPRUDENCE AND POSITIVE POLITY

Cairns, Huntington. Law as a social science. *Philosophy of science* 2, 484-98, 1935. ISIS

Carritt, Edgar Frederick. Morals and politics : theories of their relation from HOBBES and SPINOZA to MARX and BOSANQUET. 216 p. Oxford, Clarendon Press, 1935 ($2.25). ISIS

This incisive work is divided into two parts. In the first is presented a realistic critique of nine political theorists from the seventeenth through the nineteenth century. The essentially common trait of these contractual,

utilitarian and hedonistic philosophers is the search for motives ulterior to political obligation; which, the author maintains, leads largely to verbalism and lack of realistic treatment. The second section presents an analysis of the relation between morals and politics which leaves the problem largely unsolved. This discussion borders upon the trenchant "imperative-attributive" analysis of LEO PETRAJITSKY, whose fundamental work the author does not mention. R. K. M.

Homans, George C.; Curtis, Charles P., jr. An introduction to PARETO: his sociology. 299 p. New York, KNOPF, 1934. ISIS

Reviewed by R. K. MERTON, *Isis* 23, 295-96, 1935.

Mayer, Joseph. The techniques, basic concepts, and preconceptions of science and their relation to social study. *Philosophy of science* 2, 431-83, 1935. ISIS

Rashevsky, N. Outline of a mathematical theory of human relations. *Philosophy of science* 2, 413-30, 1935. ISIS

Soustelle, Jacques. Les sciences sociales et la sociologie générale. *Thalès* 1, 126-32, 1935. ISIS

44. — HISTORY OF CIVILIZATION

(General history, historical methods, biography and chronology)

Marvin, Francis Sydney. Old and new thoughts on the modern study of history. 224 p. London, NICHOLSON and WATSON, 1935 (4/6). ISIS

A companion volume to the author's *The living past* (1913). The purpose of this work is twofold: to define "what we are doing in the study of the past which is called history," and to treat "certain selected aspects of history, which possess either special beauty or special importance in the building up of mankind." It is hardly possible to review its heterogeneous contents, but it is worthwhile to indicate the subject of each chapter: 1. The change of view; 2. The purpose of study; 3. Primitive and modern; 4. The dawn of conscience; 5. The Greek miracle in poetry; 6. The Greeks in science; 7. The first universalism; 8. The greatness of Roman law; 9. The moral revolution; 10. The technical advance; 11. The growth of nations; 12. England's part; 13. The expansion of the West; 14. Freedom in unity; 15. Hope. R. K. M.

46. — HISTORY OF LANGUAGE, WRITING AND LITERATURE

Bloomfield, Leonard. Linguistic aspects of science. *Philosophy of science* 2, 499-517, 1935. ISIS

Tiberghien, Albert. Lingua belgica (a footnote to SARTON's STEVIN, *Isis* 21, 257). *Isis* 23, 445, 1935. ISIS

48.— HISTORY OF PHILOSOPHY

(*See also above* 18. *Philosophy of science*)

Freeman, Eugene. The categories of CHARLES PEIRCE. 62 p. Chicago, Open Court, 1934. ISIS

Reviewed by CHARLES MÂLIK, *Isis* 23, 296, 1935.

Peirce, Charles Sanders (1839-1914). Collected papers of CHARLES SANDERS PEIRCE. Edited by CHARLES HARTSHORNE and PAUL WEISS. Vol. V : Pragmatism and pragmaticism. xii+455 p. Cambridge, Harvard University Press, 1934. ISIS

Reviewed by CHARLES MÂLIK, *Isis* 23, 477-83, 1935.

VII. — MEDICINE

50. HISTORY, ORGANIZATION, AND PHILOSOPHY OF MEDICINE

Bühler, Hans Viktor. Das Ärztegeschlecht der Occo. Ein Beitrag zur Geschichte des Collegium medicum Augustanum. *Archiv für Geschichte der Medizin und der Naturwissenschaften* 28, 14-42, 11 fig,. 1935. ISIS

Delaunay, Paul. La vie médicale aux XVI^e^, XVII^e^ et XVIII^e^ siècles. 556 p., 114 illus. (Collection Hippocrate) Paris, LE FRANÇOIS, 1935. (40 fr.) ISIS

Contents : 1. Les étudiants en médecine; 2. La vie privée du médecin; 3. La vie professionnelle; 4. La vie corporative; 5. La vie religieuse; 6. La vie politique; 7. La vie sociale; 8. La vie intellectuelle; 9. La vie doctrinale; 10. Conclusion.

Garrison, Fielding H. (1870-1935). Life as an occupational disease. *Bull. of the New York Academy of medicine* 10, 679-94, 1934. ISIS

Garrison, Fielding H. Transvaluations and deflations in the history of medicine and its teaching. *Bull. of the New York Academy of medicine* 10, 579-92, 1934. ISIS

Haberling, W.; Vierordt, H. Biographisches Lexikon der hervorragehenden Ärzte aller Zeiten und Völker. Zweite Auflage.

Ergänzungsband, Nachträge zu den Bänden I-V. v+426 p. Berlin, URBAN & SCHWARZENBERG, 1935 (RM 37.50). ISIS

Levinson, Abraham. Pioneers of pediatrics. *Medical life* 42, 329-82, 385-420, 441, with many portraits, 1935. ISIS

Medicine, Xth Congress of the history of. Décimo congreso internacional de historia de la medicina, 23-Septiembre-29, 1935. 199 p. Illus. Madrid, 1935. ISIS

Beautiful booklet containing many photographs of Spanish monuments and distinguished historians of medicine, together with the list of early members of the Xth Congress and practical information for their use during the congress. G. S.

Pinel, E. Le mécanisme de la vaccinothérapie. *Thalès* 1, 94-125, 1935. ISIS

" Le mémoire suivant est moins une étude historique qu'un document sur l'évolution des méthodes. Vu l'importance croissante que prennent les mathématiques dans les sciences biologiques, spécialement par la voie des statistiques, ce mémoire nous semble intéressant entre autres raisons pour fixer un moment caractéristique de la pensée scientifique."

Sigerist, Henry E. Richtungen und Strömungen in der Medizin der Vereinigten Staaten. *Schweizerische medizinischen Jahrbuch*, p. XCI-XCVII, 1935. ISIS

Sigerist, Henry E. Soziologische Faktoren in der Medizin. *Zangger-Festschrift* 749-58, 1934. ISIS

Stewart, David A. Disease and history. *Annals of medical history* 7, 351-71, 1935. ISIS

Thayer, W. S. A lecture to the fourth year class of the Johns Hopkins medical school. *Bulletin of the institute of the history of medicine* 3, 613-22, 1935. ISIS

Tricot-Royer, Dr. L'histoire des sciences au Portugal (29 septembre -6 octobre 1934). 19 p. *Le scalpel*, 1934. ISIS

Tricot-Royer, Dr. Deux ancêtres de l'Association médicale Franco-Belge de la Vallée de l'Escaut, JEAN DE SAINT-AMAND et JACQUES DESPARS. 15 p. Lille, Imprimerie centrale du Nord, 1925. ISIS

Tricot-Royer, Dr. Le IXème congrès international d'histoire de la

médecine Bucarest (1932). Compte-rendu. p. 121-44, Paris, *Aesculape*, (s. d.). ISIS

Tricot-Royer, Dr. Commémoration de CORNEILLE BROECKX (cinquantenaire de sa mort). CHRISTOPHE PLANTIN (IVe centenaire de sa naissance). VÉSALE et l'art rubénien. 11 p. Anvers, DE VLIJT, 1921. ISIS

Tricot-Royer, Dr. Commentaires médicaux sur les musées d'Anvers. 31 p. Anvers, DE VLIJT, 1921. ISIS

Viets, Henry R. Some features of the history of medicine in Massachusetts during the colonial period (1620-1770). *Isis* 23, 389-405, 2 pl., 4 facs., 1935. ISIS

Wellcome, Sir Henry. Spanish influence on the progress of medical science. With an account of the Wellcome Research Institution and the affiliated research laboratories and museums founded by Sir HENRY WELLCOME. Commemorating the tenth international-Congress of the history of medicine held at Madrid 1935. 121 p., illus. London, Wellcome Foundation, (1935). ISIS

A handsome book with abundant illustrations many of which are of special interest to the historian of medicine. G. S.

51. — EPIDEMIOLOGY, HISTORY OF SPECIAL DISEASES PUBLIC HEALTH AND SOCIAL MEDICINE

Andrews, Edmund. A history of the development of the technique of herniotomy. *Annals of medical history* 7, 451-66, 1935. ISIS

Celli Fraentzel, Anna. Quellen zur Geschichte der Malaria in Italien und ihrer Bedeutung für die deutschen Kaiserzüge des Mittelalters. *Quellen und Studien Gesch. d. Naturw. u. d. Med.* 4, 1-85, 1935. ISIS

Contents : Quellensammlung für die einzelnen Regierungszeiten; 1. Karolinger, 2. Sachsen, 3. Salier, 4. LOTHAR VON SUPPLINBURG, 5. STAUFER und WELFEN, 6. HEINRICH VII : Schluss, Anhang : 1. Edikte des THEODORICH, 2. Das Auftreten der Malaria am Ende des 13. Jahrhunderts und im 14. Jahrhundert und ihre Rückwirkung auf die kurialen Verhältnisse, 3. Berichte deutscher Italienfährer aus dem 16. bis 19. Jahrhundert.

Friedman, Reuben. The story of scabies. III. *Medical life* 42, 218-68, 2 pl., facs., 1935. ISIS

Holcomb, Richmond C. The antiquity of syphilis. *Medical life* 42, 275-325, 1935. ISIS

Contents : 1. Venereal leprosy at the beginning of the modern age; 2. Divine wrath; 3. The astrologic origin; 4. CHARLES VIII and syphilis; 5. LEONICENSUS and his epidemic; 6. CHRISTOPHER COLUMBUS and the American origin; 7. The evolution of modern syphilis; 8. The transition from venereal leprosy to syphilis; 9. Gonorrhea; 10. Chancroid; 11. Syphilis of bone; 12. Neurosyphilis; 13. Cardio-vascular syphilis; 14. Venereal prophylaxis; 15. Treatment.

Lien-Teh, W. Manchurian plague prevention service. Memorial volume, 1912-1932. 469 p., 14 pl. Shanghai, National Quarantine Service, 1934. ISIS

Reviewed by CHARLES A. KOFOID, *Isis* 23, 485-87, 1935.

Sieveking, G. Herman. Der " Pesthügel " an der Tiergartenstrasse im Gelände des früheren Zoologischen Gartens in Hamburg, nebst Nachweisen über die zu Pestzeiten üblichen Arten der Leichenbestattung. *Archiv für Geschichte der Medizin und der Naturwissenschaften* 28, 1-13, 2 fig., 1935. ISIS

Tricot-Royer, Dr. Chianciano. Une station thermale étrusque de l'antiquité à nos jours. *Le scalpel*, 20 p., juillet 1934. ISIS

Tricot-Royer, Dr. Les signes distinctifs des lépreux en Belgique, *Yperman, Bulletin de la société belge d'histoire de la méd.* 2, 5-20, 2 fig., 1929. ISIS

Tricot-Royer, Dr. Les signes distinctifs des lépreux en Belgique. *Aesculape* 19, 215-26, 1929. ISIS

Tricot-Royer, Dr. Le nombre des lépreux dans l'ancien duché de Brabant. *Bulletin de l'Académie royale de médecine de Belgique* 342-49, 1928. ISIS

Tricot-Royer, Dr. Un point d'histoire : quelles étaient les affections qualifiées de lépreuses dans l'ancien duché de Brabant ? *Recueil des mémoires couronnés et autres mémoires de l'Académie royale de médecine de Belgique* 23, 10-19, 1927. ISIS

Tricot-Royer, Dr. Les lépreux de Tongerloo. 4 p. Geneva, KUNDIG, 1926. ISIS

Tricot-Royer, Dr. La léproserie d'Hérenthals (Sint-Jan-ter-Lazarijen). 16 p. Anvers, DE VLIJT, 1923. ISIS

Tricot-Royer, Dr. Les ordonnances du Magistrat d'Anvers contre les maladies dites pestilentielles. 12 p. Anvers, DE VLIJT, 1923. ISIS

Tricot-Royer, Dr. Les haitiés dans les léproseries belges. Atti dell' VIII congresso internazionale di storia della medicina — Roma 22-27 settembre 1930. 30 p. Pisa, LISCHI, 1931. ISIS

Van Andel, M. A. Geneesmiddelen tegen den steen der nieren en der blase. *Bijdragen tot de geschiedenis der geneeskunde* 15, 152-57, 1935. ISIS

Wakil, A. W. The third pandemic of plague in Egypt. Historical and statistical epidemiological remarks on the first thirty-two years of its prevalence. 169 p., 26 charts. (Publ. no. 3, Faculty of Medicine, Egyptian University). Cairo, 1932. ISIS

Reviewed by C. A. KOFOID, *Isis* 23, 297-98, 1935.

Wehrbein, H. L. Therapy in gonorrhea, an historical review. *Annals of medical history* 7, 492-97, 1935. ISIS

Zimmermann, Ernest L. The early history of *alopecia syphilitica*. *Janus* 39, 105-26, 1935. ISIS

52. — HISTORY OF HOSPITALS, OF MEDICAL TEACHING, AND OF THE MEDICAL PROFESSION. BALNEOLOGY, MEDICAL GEOGRAPHY.

Castiglioni, Arturo. The medical school at Padua and the renaissance of medicine. *Annals of medical history* 7, 214-27, 4 fig., 1935. ISIS

Cunningham, Eileen R. Development of medical education schools of medicine. *Annals of medical history* 7, 228-41, 1935. ISIS

Gonnet, P. L'histoire et la légende des hôpitaux de la Chanal & Sainte Catherine de Lyon. *Bull. de la soc. franç. d'hist. de la méd.* 29, 92-114, 1935. ISIS

Sigerist, Henry E. The history of medical licensure. *Journal of the American medical association* 104, 1057-60, 1935. ISIS

Tricot-Royer, Dr. Coup d'œil sur l'ancienne faculté de médecine de Louvain. *Revue des questions scientifiques* 28 p., juillet 1927. ISIS

Tricot-Royer, Dr. L'histoire de la médecine à Lovenjoul. Coup d'œil sur l'ancienne Faculté de médecine de Louvain. *Revue médicale de Louvain*, 8 p., 1927. ISIS

53. — PHARMACY. PHARMACOLOGY. TOXICOLOGY.

Adlung, A.; Urdang, G. Grundriss der Geschichte der deutschen Pharmazie. Herausgegeben auf Veranlassung der Gesellschaft für Geschichte der Pharmazie mit Unterstützung durch die Deutsche Apothekerschaft. viii+647 p. Berlin, SPRINGER, 1935. ISIS

" Das vorliegende Buch ist aufgebaut auf den von URDANG bereits auf den Naturforscherversammlungen in Innsbruck (1924), Düsseldorf (1926), Hamburg (1928) und in der Deutschen Pharmazeutischen Gesellschaft (1923) aufgestellten Grundsätzen für die Geschichtsschreibung der Pharmazie, die auch in den " Richtlinien " der Gesellschaft für Geschichte der Pharmazie ihren Niederschlag gefunden haben." Inhalt : Die Vorgeschichte der Pharmazie bis zum Entstehen der Apotheken im heutigen Sinne; 1. Das Apothekergewerbe; 2. Der Arzneischatz der Apotheken; Die pharmazeutische Technik; Pharmazeutische Kulturgeschichte; Pharmazeutisch-Biographisches; Die deutsche Apotheke im Wandel der Zeit.

Goldwater, Leonard J. A short history of iron therapy. *Annals of medical history* 7, 261-67, 1935. ISIS

Kremers, Edward. " Poudres des Jésuites " and ginseng. *Isis* 23, 446, 1935. ISIS

Neuss, Erich. Geschichte der Apotheke " Zum blauen Hirsch " in Halle a.d. Saale. 1535-1935. 61 p., illus. Mittenwald (Bayern), NEMAYER, 1935. ISIS

VIII. — EDUCATION

(the methods of accumulating, imparting and diffusing knowledge)

54. — EDUCATION

Champneys, M. C. An English bibliography of examinations, 1900-1932. xxiv+141 p. London, MACMILLAN, 1934. ISIS

Reviewed by T. A. A. BROADBENT, *Mathematical gazette*, 19, 64, 1935. Bibliography of books and articles published in Great Britain, 1900-1932 (and a short list from 1700 onwards) which have influenced the examination question. C. W. A.

Seybolt, Robert Francis. The public schools of colonial Boston, 1635-1775. x+101 p. (*Harvard documents in the history of education*, 2). Cambridge, Harvard University Press, 1935. ISIS

55. — ACADEMIES, SOCIETIES, CONGRESSES, NATIONAL AND INTERNATIONAL ORGANIZATION OF SCIENCE.

(Societies and congresses devoted to particular sciences are classified under those sciences. For the internal organization of science — ISIS 1, 195 — *see section* 17).

Gauja, Pierre. L'Académie des sciences de l'Institut de France. 143 p., ports. Paris, GAUTHIER-VILLARS, 1934. ISIS

Excellent summary made with great care and excellently illustrated. This little book is truly a model of its kind. The same author wrote *Les fondations de l'Académie des sciences* (Paris, 1917; *Isis* 3, 152). G. S.

56. — BIBLIOGRAPHY

(Methods, libraries)

Collard, Auguste. Une bibliothèque belge centenaire. La Bibliothèque de l'Observatoire royal et de l'Institut royal météorologique de Belgique — 1833-1933. 31 p. *Archives, Bibliothèques et Musées de Belgique* 12, 1935. ISIS

Collijn, Isak. Kartusianerklostret Mariefred vid Gripsholm och dess bibliotek. *Nordisk Tidskrift för Bok-och Biblioteksväsen* 22, 147-78, 1935. ISIS

58. — CATALOGUES OF SECOND-HAND BOOKS ON THE HISTORY AND PHILOSOPHY OF SCIENCE.

Many catalogues of second-hand books are so interesting and so full of valuable information that we shall henceforth register them in this section, together with other lists of a similar nature, such as catalogues of scientific medals and prints. When applying to the publishers of these catalogues for a copy, please mention *Isis*.

Barbazan, Julian. Autógrafos, manuscritos, libros con dedicatorias autógrafas. Obras varias (por orden de materias). N. 14, 97 p., 1543 items. Madrid, CONSTANTINO RODRIGUEZ, 4, 1935. ISIS

Blackwell, B. H. Catalogue of Semitica including Egyptology, Assyriology etc. Cat. 377, 60 p., 1717 items. Oxford, 50 & 51 Broad St. (received Oct. 1935). ISIS

Davis & Orioli. Catalogue LXVIII, recent purchases. 46 p., figs. London, W. C. 1, 30 Museum St. (received Oct. 1935).

Fiedler, Henry George. Books and periodicals on natural history. Catalogue no. 55, 72 p., 1796 items. New York, 89 Chambers St., 1935. ISIS

Fock, Gustav. Botanische und zoologische Iconographie sowie eine Auswahl seltener, älterer Reisewerke. Antiquariatskatalog no. 702, 33 p. Leipzig C 1, 1935. ISIS

Goldschmidt, E. P. Landmarks of pure and applied science, inventions. List no. 17, 36 p., 248 items. London, W 1, 45, Old Bond St., (received Oct. 1935). ISIS

Goldschmidt, E. P. Mediaeval literature list no 14, Ro-Z, 32 p., 810 items. London, W 1, 45, Old Bond St., (received May 1935). ISIS

Goldschmidt, E. P. Old books on science including a selection from the library of the Radcliffe Observatory. List no. 16, 36 p., 240 items. London, W 1, 45, Old Bond St., 1935. ISIS

Goldschmidt, E. P. Rare & valuable books. Catalogue 38, 65 p., 134 items, illus. London, W 1, 45 Old Bond St. (received June 1935). ISIS

Grafton & Co. Books on these subjects, series B. No. 179. 44 p., 1052 items. London, W. C. 1, 51 Great Russell St., 1935. ISIS

Heffer, W. A catalogue of books on travel and exploration including a collection of early voyages and travels, Jesuit relations, etc. No. 454. 82 p., 1328 items. Cambridge, 3-4 Petty Cury (received July 1935). ISIS

Heffer, W. Catalogue of scientific books and publications of learned societies including a valuable collection of pamphlets formed by the late Sir ARTHUR SCHUSTER, F. R. S. No. 450, 94 p., 2535 items. Cambridge, England, 3 & 4 Petty Cury, 1935. ISIS

Junk, W. Coleoptera. No. 87, 310 p. Den Haag, Scheveningsche Weg 74, 1935. ISIS

Leighton, J. & J. Books on early science, aeronautics, palaeography, Sir FRANCIS BACON, JOHN MILTON, Sir THOMAS MORE, imaginary voyages, and a few items concerning Abyssinia, Hungary, Poland, Russia, Turkey. Catalogue no. 29, 42 p., 350 items. London,

W. C. 1, 100 Great Russell St., Bloomsbury (received October 1935). ISIS

Leighton, J. & J. Religion — art — science — society. Catalogue no. 28, 66 p., 478 items. London, W. C. 1, (received June 1935).

Lier, R. New acquisitions of old medicine and natural sciences including some works on circulation of the blood, heart-diseases, JENNER and inoculation. 88 items. Galluzzo (Florence), Via S. Felice a Ema, 41, 1935. ISIS

Locomotive Publishing Co. Railway books, charts & other publications. 24 p. London, E. C. 4, 3, Amen Corner, 1935. ISIS

Mathews, Elkin. First editions in English literature, music, philosophy, science and invention. With sections on Anglo-American first editions and autograph MSS and letters. Catalogue 67, 82 p., 500 items. London, W 1, 78 Grosvenor St. (received Nov. 1935).

Nijhoff, Martinus. Catalogue of important books on pedagogics. No. 597, 42 p., 933 items. The Hague, (received Nov. 1935). ISIS

Nourry, Emile. Médecine ancienne, anatomie-chirurgie, chimie et alchimie, sciences anciennes. 72 p., 761 items. Paris, V, 62, rue des écoles, 1935. ISIS

Poppe, Karl Max. Botanik. Zeitschriften, Bücher, Monographien zum Teil aus dem Besitz der Herren. Geh. Rat. Prof. Dr. O. DRUDE, Dresden, Prof. Dr. K. FRITSCH, Graz, Prof. Dr. E. HEINRICHER, Innsbruck, Prof. Dr. P. STARK, Frankfurt a. M. ISIS

Quaritch, Bernard. A catalogue of important books on botany, many with fine coloured plates from the libraries of the late Lord BATTERSEA, Miss ELLEN WILLMOTT and other recent purchases. No. 509. 40 p., 371 items. London, W 1, 11 Grafton St., New Bond St., 1935. ISIS

Quaritch, Bernard. A catalogue of important and rare books on aeronautics, astronomy, chemistry, electricity, engineering, fortification and gunnery, horology, mathematics, meteorology, mining and minerals, navigation, physics, pyrotechnics, surveying, etc., including some important items from the library of the Radcliffe Observatory, Oxford. No. 505, 68 p., 529 items. London, W 1, 11 Grafton St., New Bond St., 1935. ISIS

Quaritch, Bernard. A catalogue of scientific periodicals and publications of learned societies and public institutions. No. 506. 68 p., 697 items. London, W 1, 11 Grafton St., New Bond St., 1935.

Sotheran, Henry. Annotated and classified list of rare and standard works on exact and applied science. Part XI : XIII. 3. mechanical and electrical engineering, chiefly arranged in sections as shown overleaf. With a supplement of rare and valuable books on exact science. London, W 1, 43, Piccadilly, 1935.

59. — MEMORIA TECHNICA

Isis no. 65 (vol. 23, 1-308, 2 pl., 33 fig., 30 p., facs.). Bruges, 1935. ISIS

This number is analyzed in the 45th Critical Bibliography. Every previous number has been analyzed in previous bibliographies. G. S.

Critical bibliography no. 45. *Isis*, vol. 25. 176-317. ISIS

This note is published at the end of our bibliography solely for the convenience of the scholars who cut out the whole or part of it, attach extracts to catalogue cards and classify them. By adding this note to the others they will be able to find out rapidly whether this particular bibliography has been analyzed or not. G. S.

60. — ERRATA. Series 35

(*For previous errata see* Isis 24, 530)

Si quis Argi oculos habere posset eosque omnes diligentissime ac accuratissime intenderet in singulos versus, multa tamen eum inter corrigendum effugerent. JOANNES MATTHAEUS (Wittenberg, 1619).

Vol. 14, 135, l. 15. EMMA WEDGWOOD (1808-96), not 1806.
Vol. 15, 554 (index). BERTRAND, L. F. J., XIV, 418 (not XIII).
Vol. 21, 679 (index). RICHER DE REIMS, XIX, 193 (not XXI).

A few other misprints are not mentioned in these errata because they are too obvious to cause any error or confusion. I wish to express my thankfulness to the readers who take the trouble to make the above-mentioned corrections in their set of *Isis* and the *Introduction*. I would advise them, after having accomplished that little task, to write their initials near mine at the bottom of this note to indicate that these and the previous errata have been taken into account. G. S.

These and the previous errata have been corrected by...

Index of Authors Included in the Forty-fifth Bibliography

The Roman figures followed by (1) or (2) refer to the centurial classification (Part I). Thus, Allen, P. S., XVI(1)E means that a paper by Allen is listed under seventeenth century, first half, subdivision E.

The Arabic figures refer to the historical and to the systematic classification (Parts II and III) which are subdivided in sections numbered consecutively from 1 to 60. For instance, Tricot-Royer, Dr., 5, 50, indicates that papers by Tricot-Royer are listed in section 5 (Rome), and in section 50 (History of medicine).

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